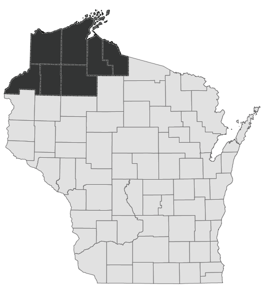
NORTHWEST WISCONSIN FLOOD IMPACT STUDY



Northwest Regional Planning Commission
NWRPC
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EDA
U.S. ECONOMIC DEVELOPMENT ADMINISTRATION

Northwest Wisconsin Flood Impact Study

HAZUS-MH Level 2 Analysis

November, 2018

This report was prepared by Northwest Regional Planning Commission using Federal funds under award number 06-69-06049 from the Economic Development Administration, Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author and do not necessarily reflect the views of the Economic Development Administration or the U.S. Department of Commerce.

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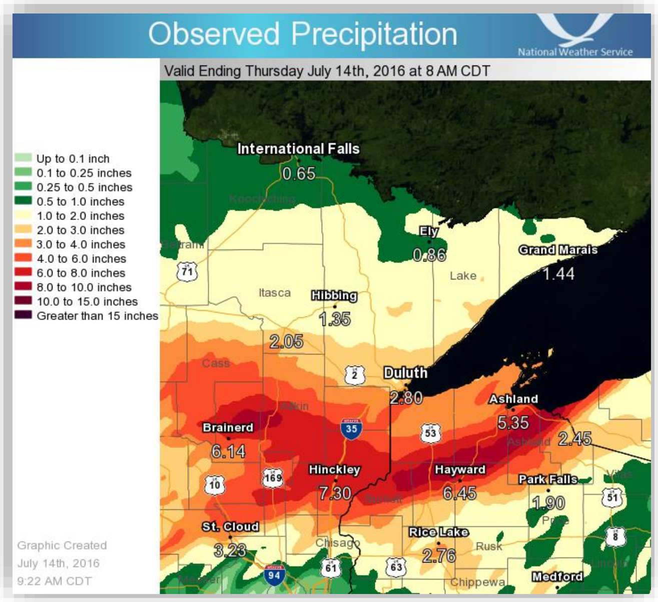
2016 NORTHWEST WISCONSIN FLOOD



Multiple rounds of severe thunderstorms impacted northwest Wisconsin on Monday, July 11th and Tuesday, July 12th, 2016. During a 24-hour period the parts of region received historically heavy rainfall, with 8 to 12 inches of precipitation falling in some areas. Some of the most intense rainfall occurred in a swath extending from northern Burnett County, northeasterly through northern Iron County. Heavy rains quickly caused rivers to rise, to in some cases – historic levels. A US Geological Survey (USGS) stream gage on the Bad River near Odanah (Ashland County) rose from 300 cubic feet per second to a record peak streamflow of 40,000 cubic feet per second in only 15 hours. In addition to the heavy rainfall, a bow echo windstorm moved across northern Iron County and caused tremendous damage at Saxon Harbor. The marina and campground were devastated by the floodwaters of Oronto Creek, a steep-gradient Lake Superior tributary which had been rerouted during harbor construction in 1965.

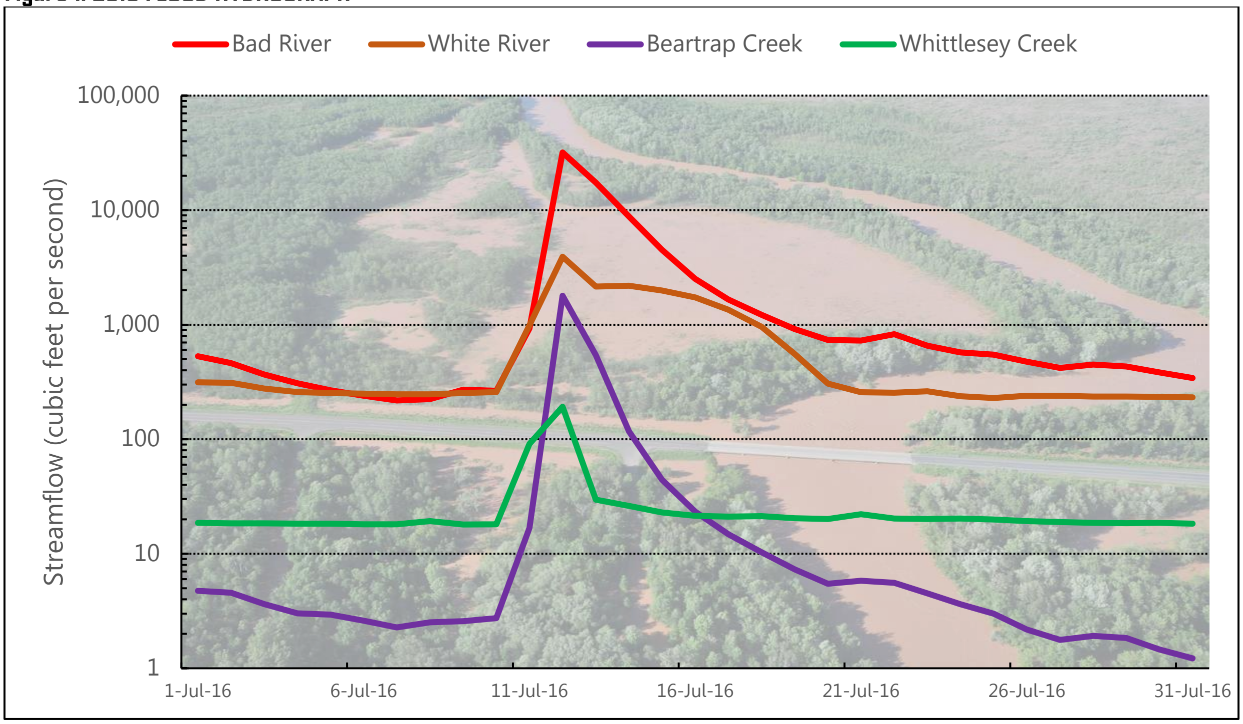
The heavy rainfall caused flash flooding across the region caused widespread and severe damage to roads and infrastructure, homes, businesses, and public facilities. In Ashland County, floodwaters overtopped U.S. Highway 2, resulting in the temporary closure of a major thoroughfare across northern Wisconsin. Travel across much of northwestern Wisconsin was not advised due to inundated roadways and washouts. The timing of these storms also coincided with the peak of tourist season in the region.

Tragically, there were four lives lost as a result of the storm. Among those lost were 58-year-old Mitch Koski, former mayor of the City of Montreal, WI and Iron County Board Supervisor. Koski was checking on the well-being of campers at Saxon Harbor when the bridge over Oronto Creek washed out, sweeping his vehicle downstream.

County, state and local government mobilized quickly in the wake of the disaster. Many of the area's roadways were inundated with water and debris and were impassible. With many of the major transportation corridors closed, long detours were necessary to navigate through the impacted region affecting residents and commerce. While highway crews were busy addressing road and bridge impacts, local emergency managers were busy assessing losses at harbors and marinas on Lake Superior. The full force of the storm hit northern Iron County and completely destroyed the marina and campground at Saxon Harbor. At the time of the storm, the marina was housing 70 boats, of which, at least 12 were destroyed, 19 beached, and 6 sunk and were later recovered. The Iron County Forestry boat, which became unmoored during the storm was last reported in the vicinity of Michigan's Keweenaw Peninsula, nearly 100 nautical miles northeast.

The Bad River Nation was also severely impacted by the storm. More than 46 homes within reservation boundaries were affected by flooding, ten of which were completely destroyed. In the wake of the storm, the reservation was completely cut off from regular access to food, water, and medical supplies. The fish hatchery and wild rice operations of the Bad River Tribe also sustained major damage.

Figure 1: 2016 FLOOD HYDROGRAPH



Region wide, the flood event impacted over 350 homes and left behind tens of millions of dollars in public sector damage.

In response to the disaster, the Wisconsin Emergency Operations Center was elevated to a Level 1 (full activation), with agency personnel from the Department of Administration, Department of Transportation, Department of Natural Resources and other state, federal and volunteer agencies coordinating resources. On July 12, 2016, a state of emergency was declared for the affected counties and state agency resources were directed to support response and recovery efforts. Emergency response efforts were supported by volunteer organizations including the American Red Cross, local volunteer fire departments, AmeriCorps, Team Rubicon, statewide tribal organizations and the Civil Air Patrol. Private sector business partners also provided resources and supplies to aid flood victims.

On August 9, 2016, a Presidential Disaster Declaration for public assistance was granted for the counties of Ashland, Bayfield, Burnett, Douglas, Florence, Iron, Sawyer, and Washburn, and the Bad River Band of the Lake Superior Chippewa. The severe flooding also impacted the agricultural industry in northwest Wisconsin, resulting in crop losses and reduced yields. Consequently, an agricultural disaster declaration was designated on September 29th, 2016 for the counties of Ashland, Bayfield, and Iron, as well as the five neighboring counties of Douglas, Price, Sawyer, Vilas, and Washburn.

Table 1: 2016 Northwest Wisconsin Flood, Damage to homes/businesses

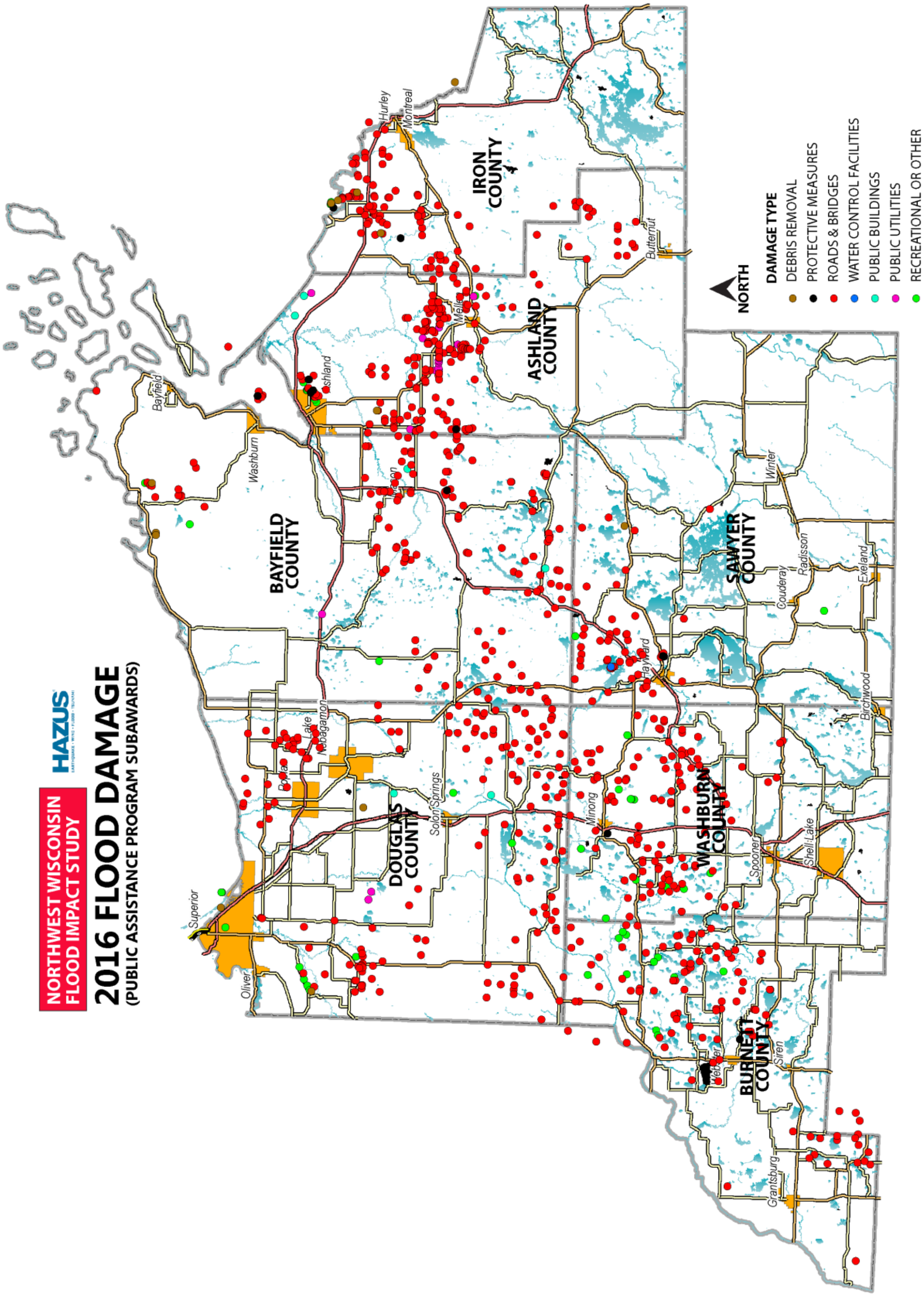
County	Affected/Minor Damage	Major Damage	Destroyed	Total
Ashland	140	2	0	$500,000
Bad River Band	30	6	10	$1,104,000
Bayfield	20	10	0	$150,000
Douglas	2	0	0	$500
Iron	13/1	12/2	0	$235,000/$40,000
Sawyer	112	0	0	$100,000
Washburn	6	9	1	$500,000
TOTAL	**323/1**	**39/2**	**11**	**$2,629,500**

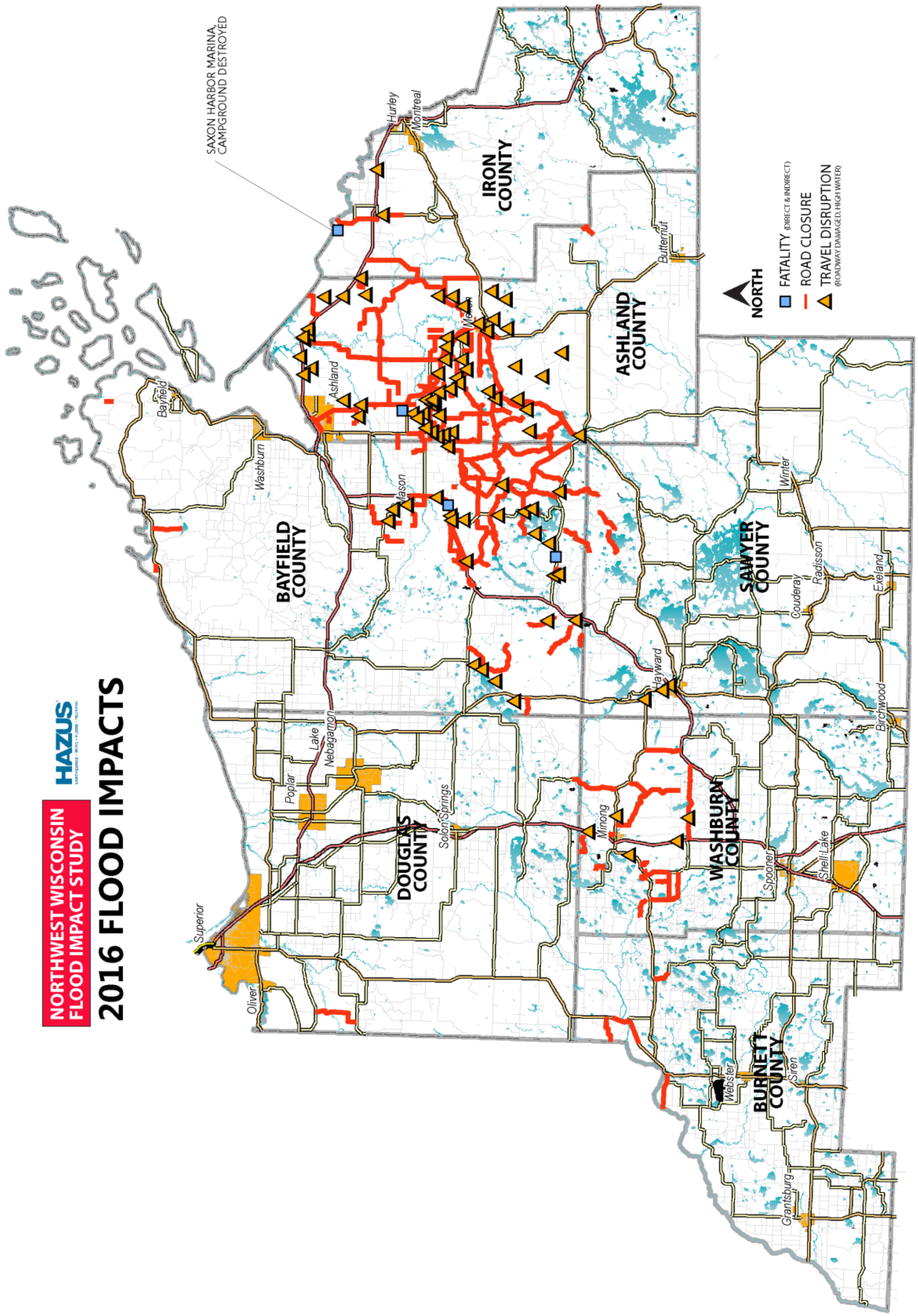
Table 2: 2016 Northwest Wisconsin Flood, Damage to Public Infrastructure

County	Total Losses
Ashland	$7,295,923
Bad River Band	$3,403,054
Bayfield	$5,422,000
Burnett	$405,000
Douglas	$797,585
Florence	$47,000
Iron	$15,778,000
Oneida	$3,500
Price	$34,000
Sawyer	$2,197,000
Washburn	$3,000,000
Wisconsin DNR (trails)	$100,000
TOTAL	**$38,540,199**

Table 3*:* 2016 CDBG, Emergency Assistance Program Grants

County	Total Grants
Ashland	$66,017.57
Bayfield	$75,865.48
Sawyer	$64,473.10
Iron	$2,160.00
Total	**$208,516.15**


NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
2016 FLOOD DAMAGE
(PUBLIC ASSISTANCE PROGRAM SUBAWARDS)
BAYFIELD COUNTY
IRON COUNTY
ASHLAND COUNTY
SAWYER COUNTY
DOUGLAS COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Superior
Oliver
Solon Springs
Lake Nebagamon
Minong
Hayward
Spooner
Shell Lake
Webster
Siren
Grantsburg
Birchwood
Exeland
Radisson
Couderay
Winter
Butternut
Mellen
Ashland
Washburn
Bayfield
Hurley
Montreal
NORTH
DAMAGE TYPE
DEBRIS REMOVAL
PROTECTIVE MEASURES
ROADS & BRIDGES
WATER CONTROL FACILITIES
PUBLIC BUILDINGS
PUBLIC UTILITIES
RECREATIONAL OR OTHER


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
2016 FLOOD IMPACTS
SAXON HARBOR MARINA,
CAMPGROUND DESTROYED
NORTH
FATALITY (DIRECT & INDIRECT)
ROAD CLOSURE
TRAVEL DISRUPTION
(ROADWAY DAMAGED, HIGH WATER)
IRON COUNTY
ASHLAND COUNTY
BAYFIELD COUNTY
SAWYER COUNTY
DOUGLAS COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Hurley
Montreal
Butternut
Mellen
Ashland
Bayfield
Washburn
Mason
Winter
Radisson
Couderay
Exeland
Hayward
Birchwood
Lake Nebagamon
Poplar
Solon Springs
Minong
Spooner
Shell Lake
Superior
Oliver
Webster
Siren
Grantsburg

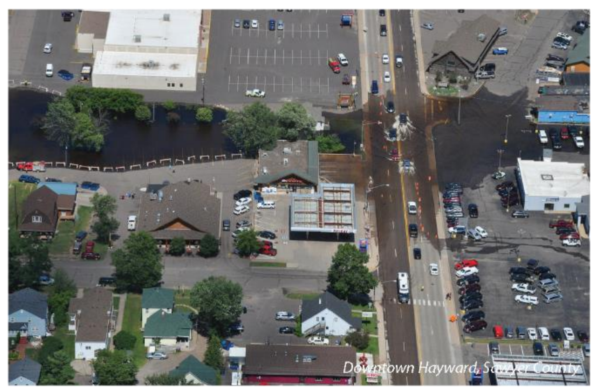

USH 2, Bad River, Ashland County

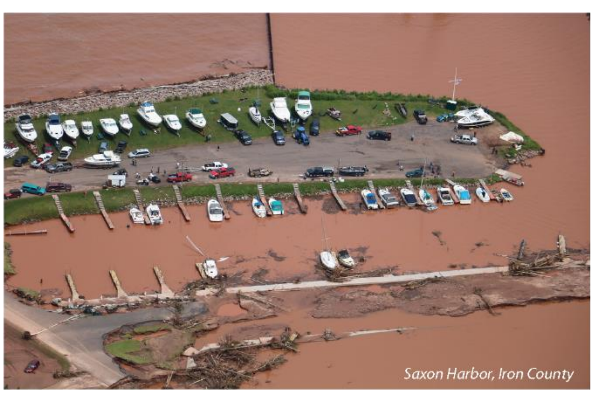

USH [illegible] Twentymile Creek, Bayfield County


Bad River, Odanah, Ashland County


Southern Doglas County


STH 13, Ashland County


Downtown Hayward, Sawyer County


Saxon Harbor, Iron County


CTH A, Oronto Creek, Iron County

Structural Impacts
Rapidly rising floodwaters quickly overtook a number of structures in low-lying areas. Over 350 structures were affected in the region, with 11 completely destroyed. The community of Odanah on the Bad River Reservation experienced some of the worst devistation, with a total of 10 structures lost. The federal disaster declaration did not cover businesses or homeowners as the level of damage in these areas did not meet the loss thresholds for federal relief. Limited CDBG-EAP funds were available to assist qulaified private property owners.

Public Infrastructure Impacts
The 2016 flood exposed a number of vulnerabilities in the region's infrastructure. The intense flood waters washed out numerous roads and bridges across the region. Many of the road and transportation system impacts were attributed to undersized culverts, which were incapable of handling the excessive floodwaters. Flooding also impacted local wastewater utilities, resulting in a 70,000 overflow at the City of Washburn wastewater treatment plant. The storm also resulted in the complete devistation of the marina and campground at Saxon Harbor.

Transportation System Impacts
Flooded and washout roadways resulted in numerous road closures across the region lasting from several days to several weeks. Major state and federal highways were impassible, including US Highway 2 and 63 and State Highway 13. Long detours made travel in the region difficult and hindered emergency response access to many areas. Many of the roadways impacted in the 2016 flood were also impacted in a 2018 flood. Canadian National Railway also closed a section of track from Ashland to Glidden due to issues from the flooding.

Health Impacts
The storms of July 11-12th resulted in the loss of four lives. The event also resulted in numerous injuries and medical emergency calls to local first responders. Transportation system disruptions resulted in some communities and residents being temporarily cut off from access medical care. Many homes across the region were without electricity fro several days, and residents were required to boil water for home use and consumption.

REGIONAL FLOOD STUDY OVERVIEW

During the period of July 11-12, 2016, seven counties in Northwest Wisconsin including Ashland, Bayfield, Burnett, Douglas, Iron, Sawyer, and Washburn and the Bad River Band of the Lake Superior Chippewa Tribe, were struck by historic severe storms and flooding that caused severe flood events throughout the region. Transportation infrastructure was heavily damaged when flood waters rose above the surface of roads and bridges. Many primary and secondary arterial roadways and culverts were washed out in the wake of the elevated water level experienced over a short time period. Damage to homes and businesses across the region was substantial, with over $2.6 million in losses reported. Damage to public infrastructure was even more significant, with $38 million reported. One of the region's most critical economic assets, Saxon Harbor, was completely destroyed and the major roadways bisecting northern Wisconsin were completely shut down. Business disruption and impacts to commerce were also significant as many communities were left completely isolated due to road closures. These counties had not anticipated, nor were they prepared to respond to an event of this historic magnitude. In the wake of the storm, county and local emergency response plans were implemented and the Wisconsin Emergency Operations Center was activated. In consultations with the Governor's Cabinet secretaries, county and local government officials expressed grave concerns about the state of local infrastructure, the need for better resiliency planning and the economic impacts of flooding on the tourism-dependent economy of northern Wisconsin.

While many of repairs to the flood damage in northern Wisconsin have been completed, the reconstruction of Saxon Harbor is still in progress. Across this region of Wisconsin there has been very limited efforts to identify, evaluate, and address critical infrastructure in the event of future natural disasters- particularly the economic impact susceptibility related to business commerce, emergency services, transportation, communication, and utilities. Furthermore, there is virtually nothing in place to address community resiliency and business recovery after major storm events occur.

In 2013, a pilot flood resiliency study project was completed by the Northwest Regional Planning Commission (NWRPC) for Taylor County, Wisconsin, which demonstrated the potential impacts of historic flood events, pre-identified likely impact areas and assessed the economic impacts to communities, businesses and residents. The study was incorporated into the county's hazard mitigation plan and now serves as a point of reference to guide flood mitigation activities across the county, which in turn, improves resiliency. This proposal would replicate the process model developed under the 2013 Taylor County pilot project for the seven counties (including the Bad River Band of Lake Superior Chippewa) of northwestern Wisconsin impacted by the historic severe storm event of July, 2016 (Presidential Disaster Declaration DR-4275).

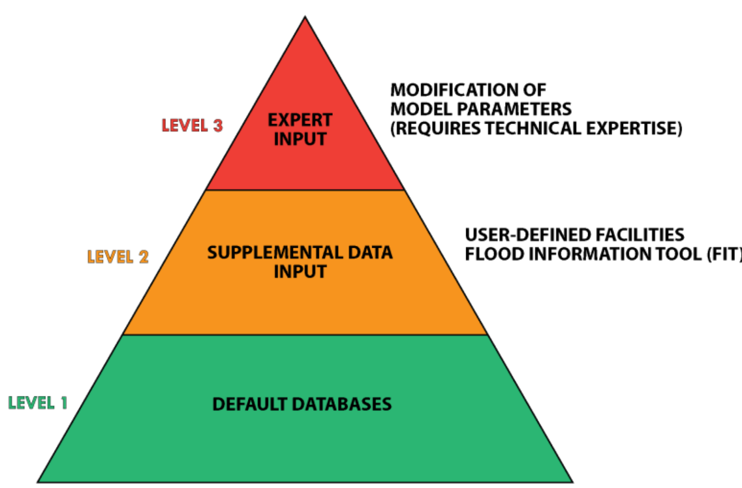
This process model uses FEMA's HAZUS software to estimate potential flood losses and to identify structures, businesses, economic assets and community infrastructure impacted by a historic flood event. The HAZUS model will allow for the identification of vulnerable areas that may require planning consideration. Understanding flood risk will allow communities to assess the level of readiness and preparedness to deal with a flood disaster before it occurs. Model results will provide decision makers with the information and tools needed to decide on how to allocate resources for most effective and efficient response and recovery.

Effective local leadership is crucial to economic development, disaster resilience, and economic

recovery activities in northwest Wisconsin communities. This project includes an outreach component to engage with local governing bodies and communities to help them understand why identifying and managing risks, proactively reducing vulnerabilities and improving response and recovery capabilities are key to promoting economic development resilience across the region. This program will not only advance flood resilience, it also would improve and protect water quality and riparian and shoreline habitat.

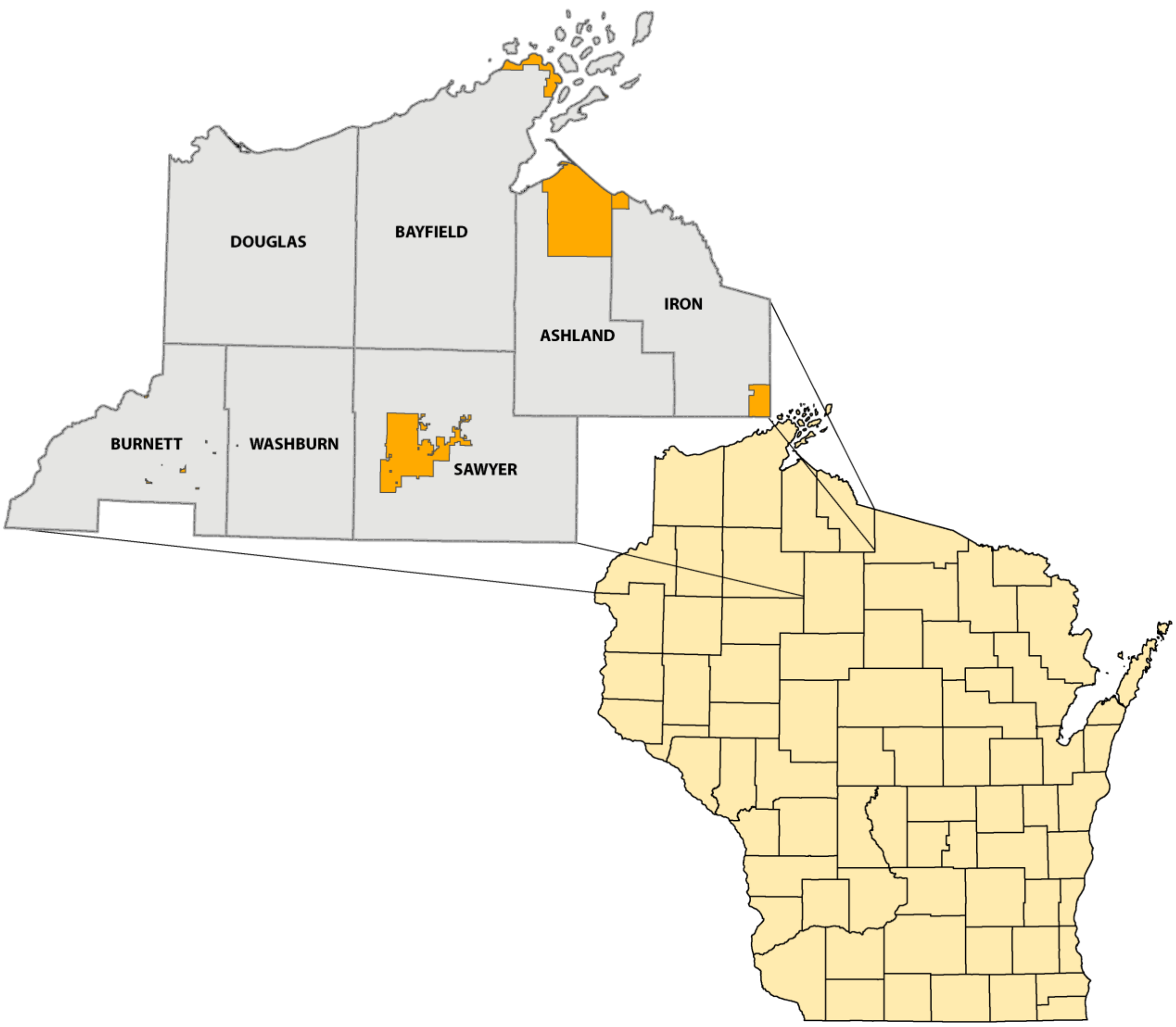
HAZUS-MH

HAZUS is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. It graphically illustrates the limits of identified high-risk locations due to earthquake, hurricane, flood, and tsunami. Users can then visualize the spatial relationships between populations and other more permanently fixed geographic assets or resources for the specific hazard being modeled, a crucial function in the pre-disaster planning process. The HAZUS module provides varying levels of analysis based on the level of expertise of the user and the availability of locally-derived data inputs. Under a *basic* analysis, HAZUS generates a simplified analysis using the default national databases and parameters contained in the HAZUS software package. This is commonly referred to as the "out of the box" analysis, as no external data sources or parameter manipulation are required. An *advanced* analysis requires more detailed information on local hazard conditions than is provided by the default national databased included in HAZUS. National default inventories may be replaced by user-defined inputs of buildings, essential facilities or other infrastructure. More detailed topographic data, such as LiDAR (light detection and ranging) can be used to produce accurate maps and bare-earth terrain models. The HAZUS flood model uses ground elevation to determine flood depth of a particular area. Advanced analysis using HAZUS generally requires more user expertise.



STUDY REGION

The study region includes the 7 counties of northwest Wisconsin under the 2016 federal disaster declaration DR-4276. This include the counties of Ashland, Bayfield, Burnett, Douglas, Iron, Sawyer and Washburn. Within this geographic region, there are 148 units of local government and 5 tribal nations.



HAZUS-MH FLOOD MODEL

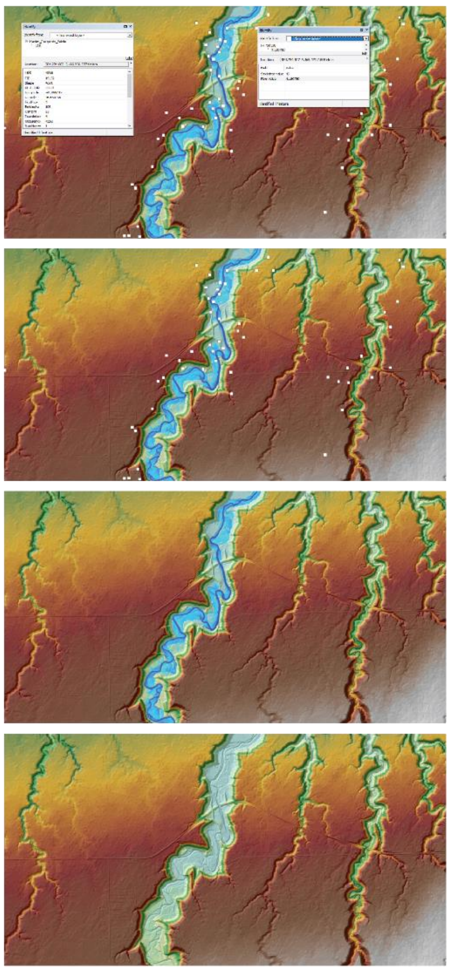
The HAZUS-MH Flood Model allows end users to perform a wide range of flood hazard analyses using default databases, user-defined databases or a combination of the two. The analyses performed in HAZUS-MH can be used to support planning and flood mitigation activities. The HAZUS-MH Flood Model can be used to assess both riverine and coastal flooding and estimates potential damage to buildings, essential facilities, transportation lifelines, utility lifelines, vehicles and agricultural crops. Analysis option within the HAZUS-MH module include:

- Studies of specific return intervals of floods (e.g., 100-year or 500-year return intervals).
- Studies of discharge frequencies, including analysis of discharges from specific streams and the exposure to buildings and population from the resultant flooding.
- Studies of annualized losses from flooding.
- Quick Look assessments, which allows the user to quickly evaluate potential flooding from specific flood depths at specific locations.
- What if scenarios, which allow users to evaluate the consequences of specific actions, such as the introduction of flow regulation devices, acquisition of flood-prone properties and other mitigation measures.

Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

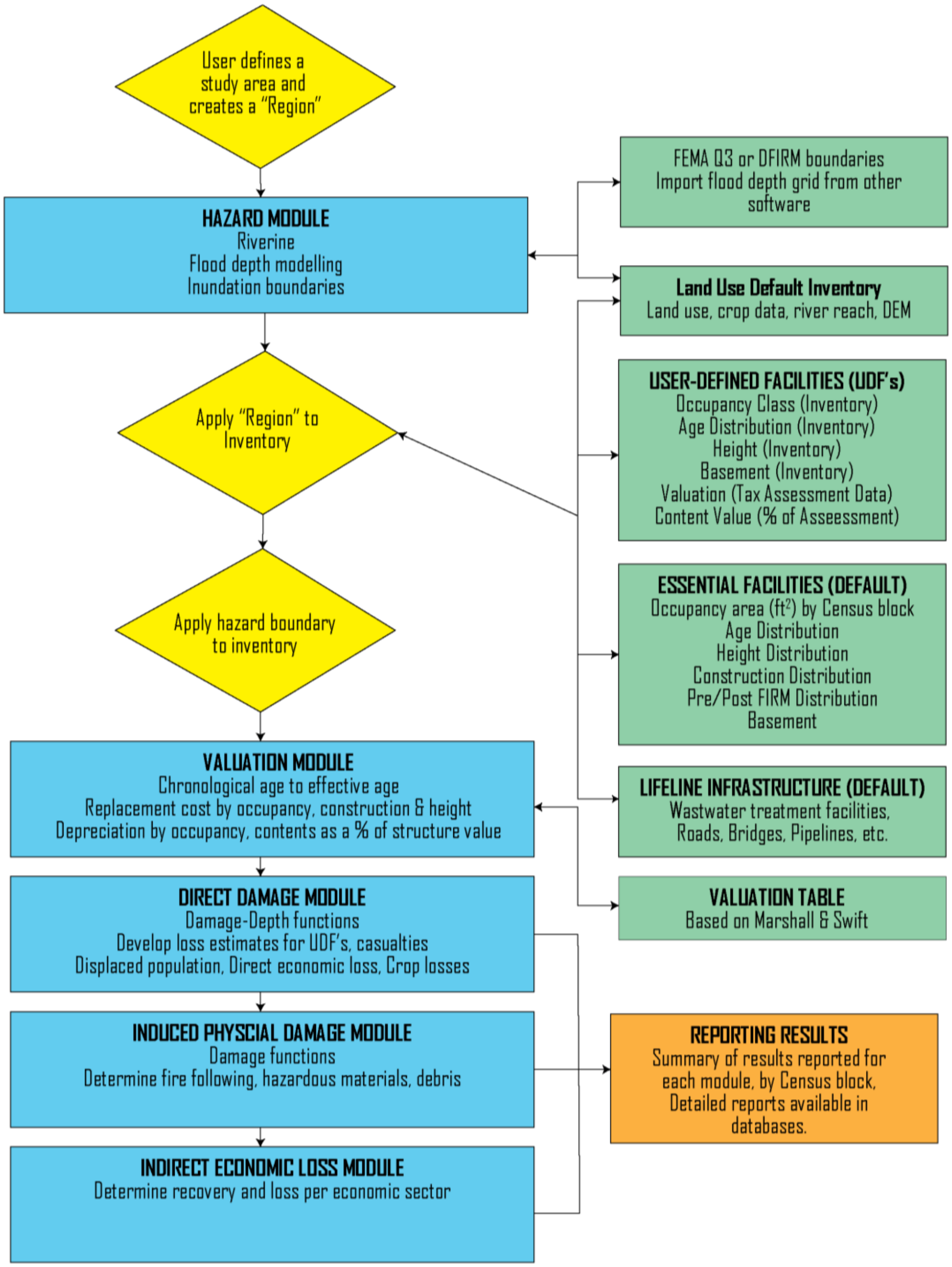
Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.41	0.14	0.00	0.01	0.55
	Content	0.22	0.40	0.00	0.03	0.64
	Inventory	0.00	0.02	0.00	0.00	0.02
	Subtotal	0.62	0.56	0.00	0.03	1.22
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.02	0.02
	Subtotal	0.00	0.00	0.00	0.02	0.02
ALL	Total	0.62	0.56	0.00	0.05	1.24

Estimate Losses



The riverine flood hazard analysis module uses characteristics, such as frequency, discharge and ground elevation to estimate flood depth, flood elevation and flow velocity. Economic losses resulting from floods are estimated by HAZUS-MH using depth-damage functions (DDFs) which correlate inundation depth to building and content losses.

Figure 4: HAZUS MODEL FLOW DIAGRAM

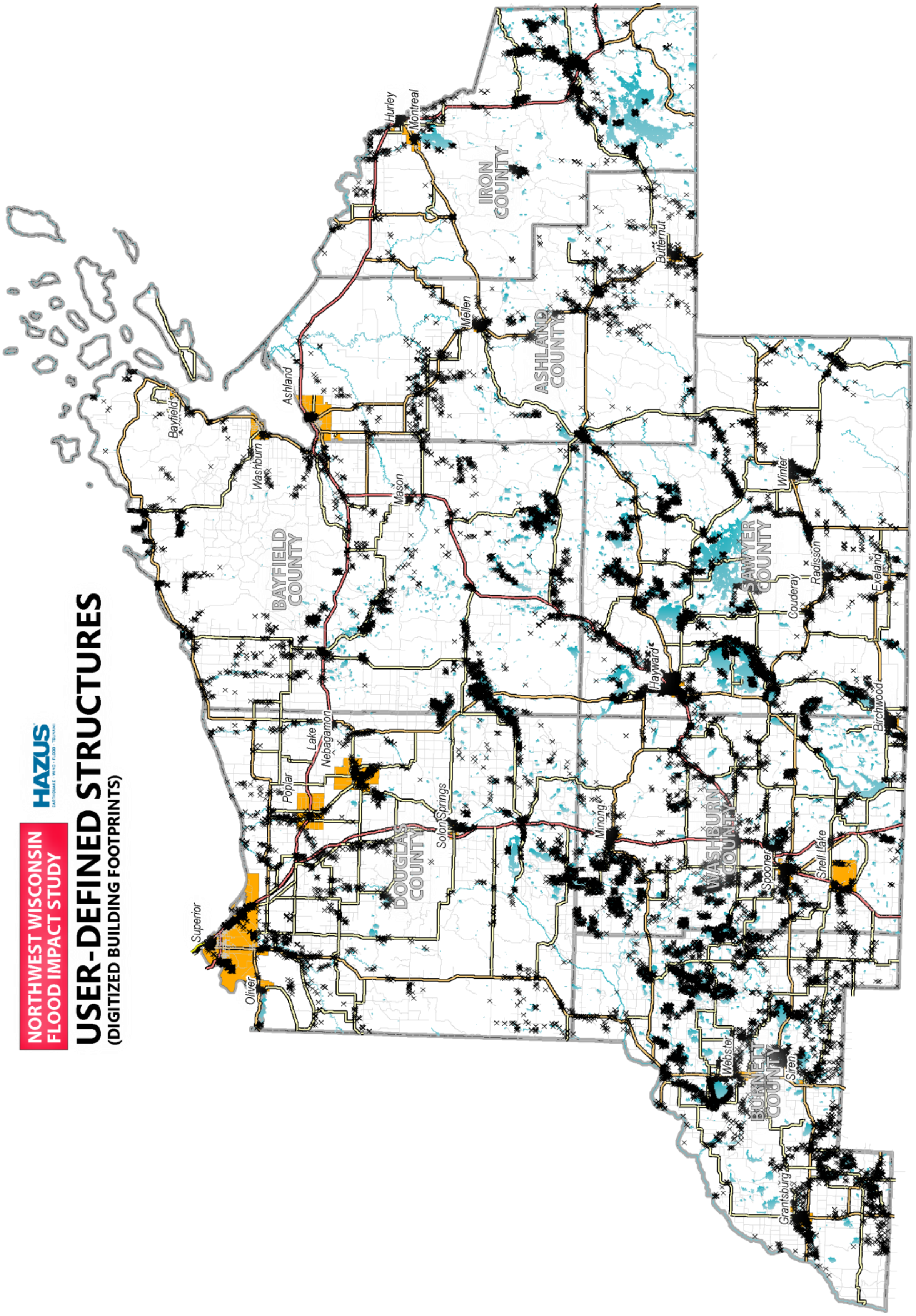


USER-DEFINED FACILITIES (UDF)

The key General Building Stock (GBS) databases in HAZUS-MH include square footage by occupancy and building type, building count by occupancy and building type, valuation by occupancy and building type, and general occupancy mapping. Under a level 1 analysis residential structures are derived from Census 2010 and non-residential structures are derived from Dun & Bradstreet (D&B). In order to greatly improve the accuracy of the outputs derived from HAZUS-MH, the default GBS was replaced with user-defined facilities (UDFs) which reflect the actual building footprints as identified through LiDAR, aerial imagery and field reconnaissance.

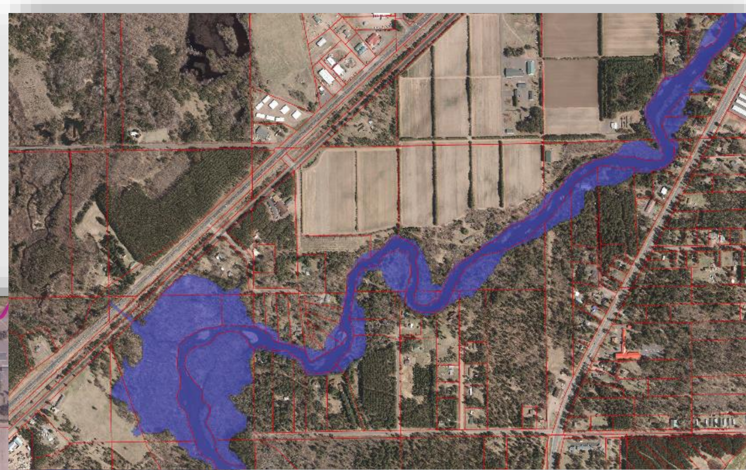
For modelling purposes, UDFs within the project area was pre-identified within a preliminary inundation zone created by executing a level 1 analysis using USGS National Elevation Dataset (NED) topographic data. It was assumed that all structures identified within flood hazard boundary created using NED data would also be affected in a scenario using LiDAR topographic data. To provide context, all adjacent structures were also digitized. The flood hazard boundary was buffered by ¼ mile and UDF footprints within boundary file were digitized. A total of 36,062 user-defined facilities were identified within the seven-county project area.

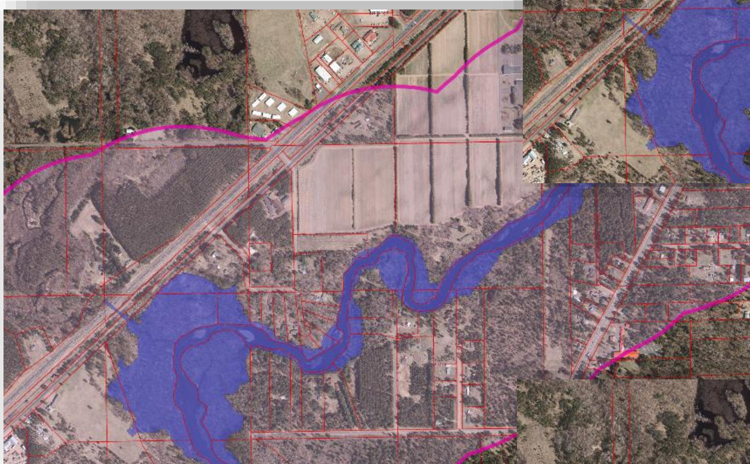
Several attributes were assigned to the UDFs in ArcGIS®. Attribute data is used by HAZUS-MH to determine flood impacts and model estimated losses. HAZUS requires seven model attributes, including occupancy, building type, replacement cost, year built, number of stories, foundation type and first floor height.


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
USER-DEFINED STRUCTURES
(DIGITIZED BUILDING FOOTPRINTS)
IRON COUNTY
ASHLAND COUNTY
BAYFIELD COUNTY
DOUGLAS COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Hurley
Montreal
Butternut
Mellen
Ashland
Bayfield
Washburn
Mason
Winter
Radisson
Couderay
Exeland
Hayward
Birchwood
Superior
Oliver
Poplar
Lake Nebagamon
Solon Springs
Minong
Spooner
Shell Lake
Webster
Siren
Grantsburg

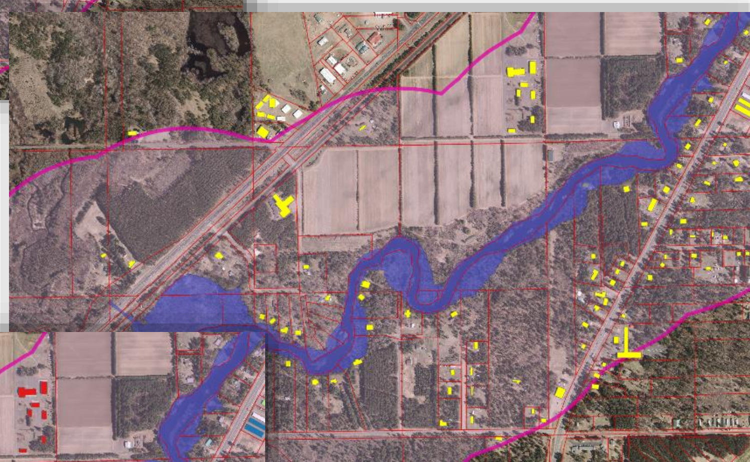
DIGITIZATION PROCESS MODEL

Step 1: Run level 1, 500-year flood model to create inundation grid.

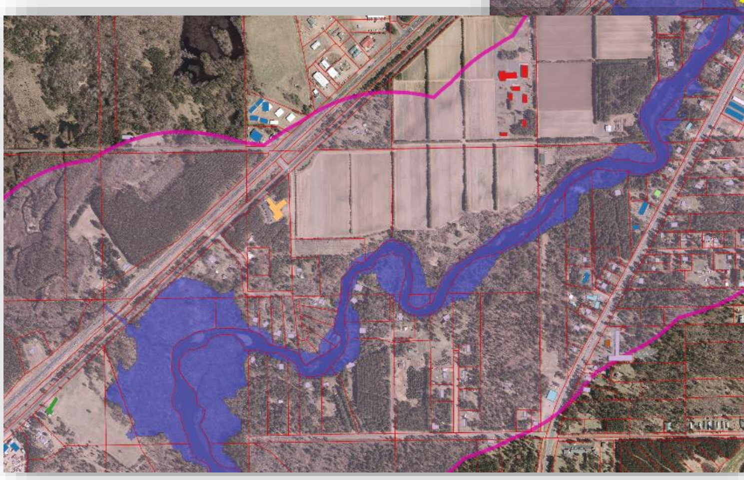




Step 2: Intersect inundation grid with tax parcels



Step 3: Use aerial imagery to determine which parcels have structures.



Step 4: Create building footprints, differentiate primary and secondary structures and assign UDF attributes.

USER-DEFINED FACILITY ATTRIBUTES

UDF ATTRIBUTE	DATA	SOURCE
ADDRESS	Parcel Address	Tax Assessment Data
LATITUDE	Building Footprint Centroids	NWRPC
LONGITUDE	Building Footprint Centroids	NWRPC
OWNER NAME	Parcel Owner Name	Tax Assessment Data
PARCEL ID	Parcel identification Number	Tax Assessment Data
OCCUPANCY TYPE*	Visual Interpretation of Aerial Imagery	NWRPC
REPLACEMENT COST*	Estimated Fair Market Value	Tax Assessment Data
CONTENT COST*	HAZUS Multiplier Based on Occupant	NWRPC
NUMBER OF STORIES*	Visual Interpretation of Aerial Imagery	NWRPC
AREA (SQUARE FEET)*	Calculated Based on Footprints	NWRPC
FOUNDATION TYPE*	Visual Interpretation of Aerial Imagery	NWRPC
FIRST FLOOR HEIGHT*	Visual Interpretation of Aerial Imagery	NWRPC

*Required HAZUS-MH Attribute

REQUIRED HAZUS-MH ATTRIBUTES

REPLACEMENT COST

This attribute was populated using the estimated fair market value data (EFMV) included in the Wisconsin Statewide Parcel GIS data. For parcels without EFMV, median values for other buildings with the same given occupancy classification were substituted.

CONTENT COST

This attribute is an estimated dollar value of the contents of a flood impacted structure. Since the actual value is unknown, HAZUS-MH default contents values were used. These values are derived by taking a percentage of the Replacement cost and multiplying by a given value based on Occupancy class

NUMBER OF STORIES

This attribute is simply the number of stories a given structure contains. It was derived from various sources including aerial imagery, Bing "Birds-Eye" imagery, & Google Maps/Street View imagery.

FOUNDATION TYPE

This attribute refers to the base below a flood a flood impacted structure. In the case of this analysis all buildings were either assigned as having a basement (single family/multi-family residential) or being built on a slab (lakefront property & mobile homes). Assigning a foundation type affects how the damage depth curve is applied to a structure. For example, a structure with a basement is likely to have more substantial damage than a mobile home, at a given flood depth.

FIRST FLOOR HEIGHT
This attribute describes the height above ground of a buildings first floor. This attribute can be populated in a few ways. For instance, it can be supplied from tax assessor information (if available), field measurement, or by measuring from the door threshold to ground surface in oblique imagery. In the case of this analysis, we used HAZUS-supplied values based on foundation type.

AREA
This attribute is the total area of a structure, in square feet. It is used to derive inventory costs for some commercial and industrial occupancy classes. This value does not include accessory buildings, attached garages or patios and decking. This value was calculated based on building footprints, in ArcGIS®.

USER DEFINED FACILITY ID
A numerical unique identifier given to each structure in the analysis.

OCCUPANCY CLASS
HAZUS-MH groups buildings with similar valuation, damage and loss characteristics into a set of pre-defined categories for analysis.

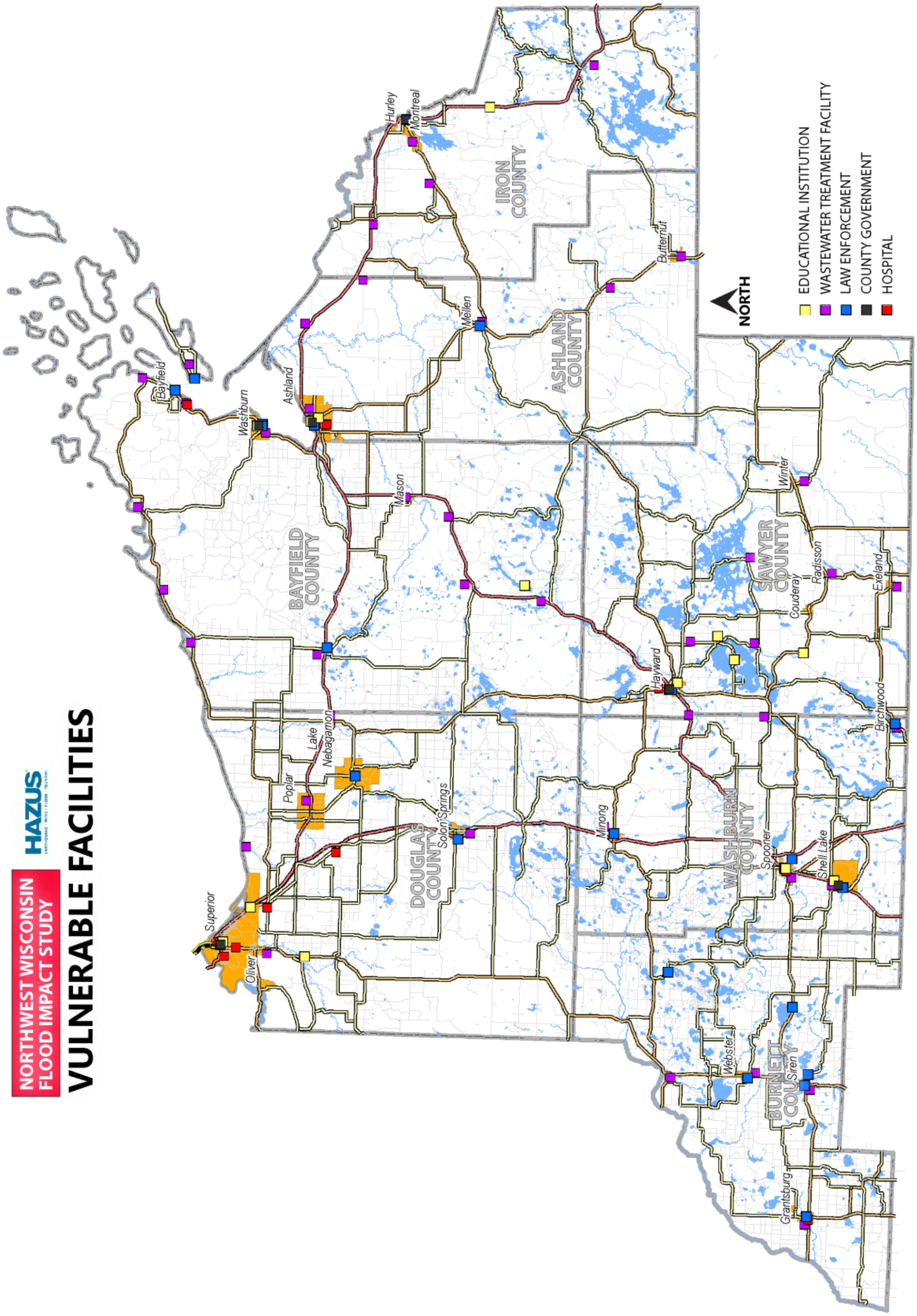
OCCUPANCY CLASS

Occupancy class is important in determining economic loss, since building value is primarily a function of building use. Occupancy classifications assigned to buildings in the study region were assigned through aerial photo interpretation, tax roll information and research.

CODE	Table 4: Occupancy Class	Contents Value
	RESIDENTIAL	
RES 1	Single Family Dwelling	50
RES2	Mobile Home	50
RKS3	Multi Family Dwelling	50
RES4	Temporary Lodging	50
RES5	Institutional Dormitory	50
RES6	Nursing Home	50
	COMMERCIAL	
COM 1	Retail Trade	100
COM2	Wholesale Trade	100
COM3	Personal and Repair Services	100
COM4	Professional/Technical/ Business Services	100
COM3	Banks	100
COM6	Hospital	150
COM7	Medical Office/Clinic	150
COM8	Entertainment & Recreation	100
COM9	Theaters	100
COM 10	Parking	50
	INDUSTRIAL	
IND1	Heavy	150
IND2	Light	150
IND3	Food/Drugs/Chemicals	150
IND4	Metals/Minerals Processing	150
IND5	High Technology	150
IND6	Construction	100
	AGRICULTURE	
AGR1	Agriculture	100
	RELIGION/NON-PROFIT	
REL1	Church/Membership Organization	100
	GOVERNMENT	
GOV1	General Services	100
GOV 2	Emergency Response	150
	EDUCATION	
EDU1	Schools/Libraries	100
HDU2	Colleges/Universities	150

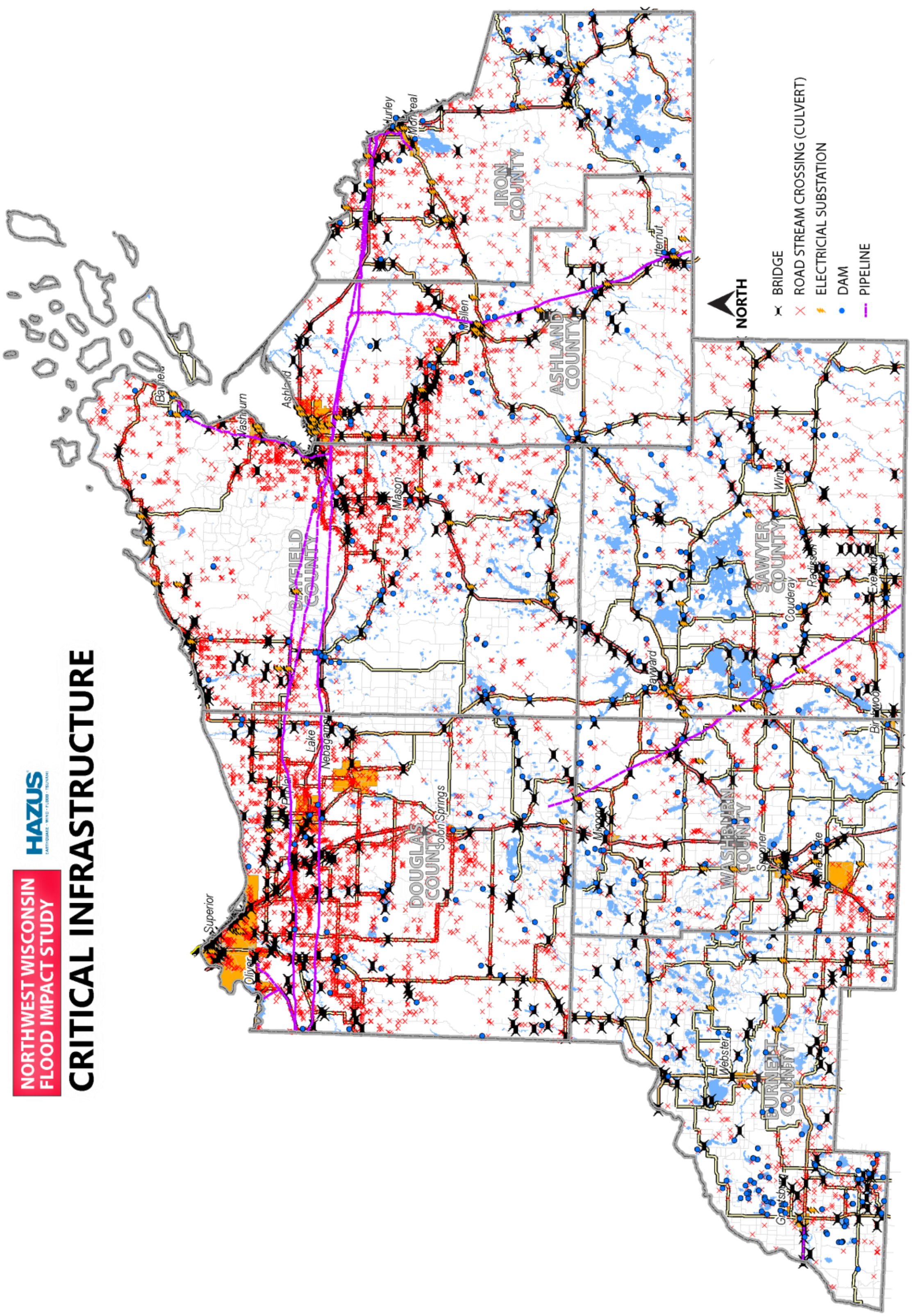
VULNERABLE AND CRITICAL FACILITIES

Critical community facilities include those that provide essential emergency services to the community and should be functional after a flood. These facilities include hospitals, police stations, fire stations, emergency medical services and educational institutions. HAZUS-MH includes national datasets which identify a range of essential facilities across the country. The default data provided by HAZUS-MH was determined to be incomplete for the study region, thus supplemental data was created to create a comprehensive profile of these assets across the region. Because these assets are tax exempt functions of government, they have no assessed or fair market valuation.


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
VULNERABLE FACILITIES
NORTH
EDUCATIONAL INSTITUTION
WASTEWATER TREATMENT FACILITY
LAW ENFORCEMENT
COUNTY GOVERNMENT
HOSPITAL
IRON COUNTY
ASHLAND COUNTY
BAYFIELD COUNTY
SAWYER COUNTY
DOUGLAS COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Hurley
Montreal
Butternut
Mellen
Ashland
Washburn
Bayfield
Mason
Winter
Radisson
Couderay
Exeland
Hayward
Birchwood
Lake Nebagamon
Poplar
Solon Springs
Minong
Spooner
Shell Lake
Superior
Oliver
Webster
Siren
Grantsburg

CRITICAL INFRASTRUCTURE

Critical infrastructure is defined as the transportation and utility infrastructure that provides communities with communications, water, power, mobility and other necessities for both continuity of governance and economic health. HAZUS-MH provides limited default data, but due to the sensitive nature of these facilities, national datasets are typically unavailable. Therefore, it is usually necessary for local communities to provide the data for analysis.


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
CRITICAL INFRASTRUCTURE
NORTH
BRIDGE
ROAD STREAM CROSSING (CULVERT)
ELECTRICIAL SUBSTATION
DAM
PIPELINE
DOUGLAS COUNTY
BAYFIELD COUNTY
ASHLAND COUNTY
IRON COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Superior
Oliver
Solon Springs
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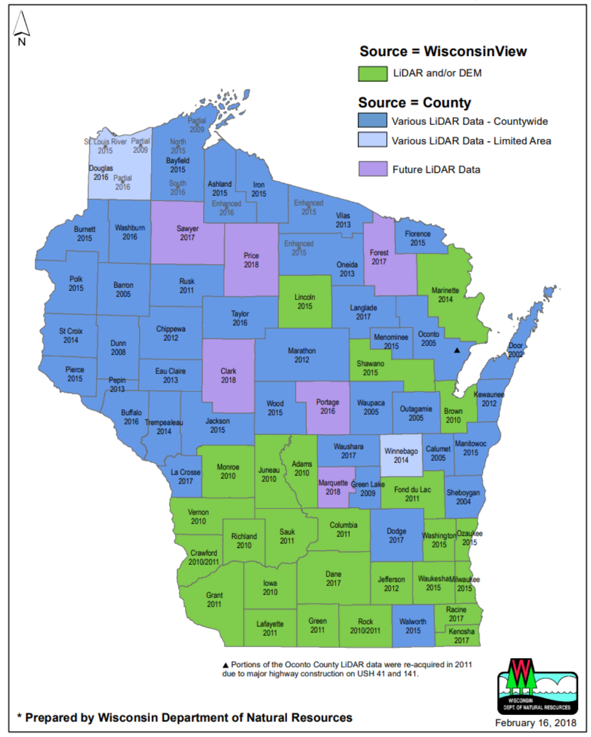
TERRAIN SURFACE MODEL

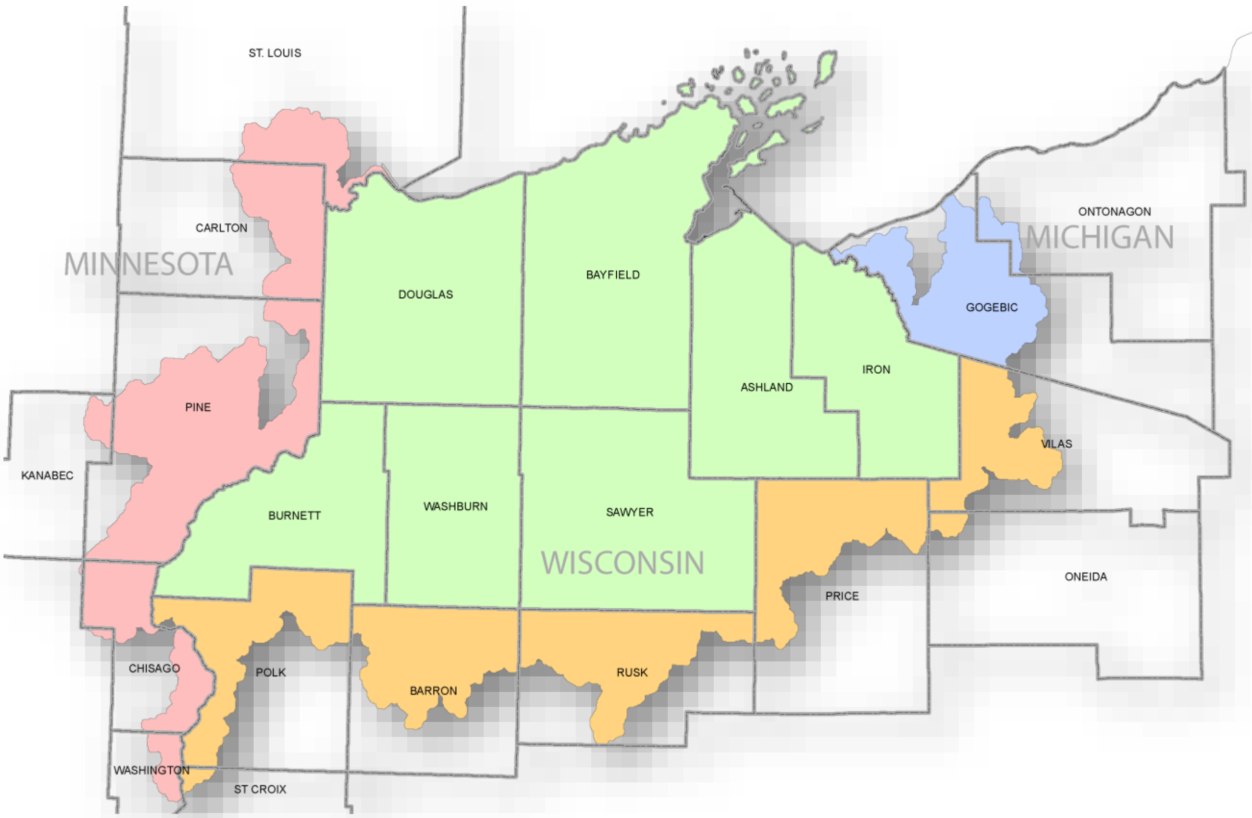
Wisconsin LiDAR Inventory*



HAZUS-MH uses a digital elevation model (DEM) to generate stream channel and floodplain morphology. DEM accuracy is also important in modeling flood depths, which HAZUS-MH uses to estimate flood losses. The most precise elevation data available for the study area is *Light Detection and Ranging* data (LIDAR). LIDAR is a surveying method that uses pulses of light which reflect of off objects (building, trees, ground, etc.) and then are recaptured by a sensor. These sensors are usually attached to an aircraft, which follows a pre-determined flight path, ensuring complete coverage for a project area. In most cases a county. By measuring the differences in return time and wavelength of the reflected light pulses, detailed 3D representations of scanned objects can be developed. The sensor's collection of these light pulses, or "returns" (once post processed) creates a 3-dimensional point cloud. Each one of point in the cloud is classified with an x, y, & z coordinates and can also contain additional information. Each county included in our study area has its own collection of point clouds which are stored as LAS datasets. These datasets are massive in size. Multiple terabytes of storage were required to house them and the processing of this amount of data was incredibly time consuming.

LIDAR data was available for each of the seven counties in the project area. As drainage areas do not necessarily correspond to jurisdictional boundaries, it was necessary to process terrain data outside of the project area boundary in order to develop accurate hydraulic models. This external area includes portion of St. Louis, Carlton, Pine, Kanabec, Chisago and Washington Counties in Minnesota and Gogebic and Ontonagon Counties in Michigan. In Wisconsin, the external area includes portions of St. Croix, Polk, Barron, Rusk Price Vilas and Oneida Counties. While supplemental LIDAR data was available for the external area in Minnesota and some counties in Wisconsin, this information was not available for Michigan. In cases where LIDAR was unavailable, US. Geological Survey (USGS) National Elevation Data (NED) at a resolution of 1/3rd arc second (10 meters) was used. NED data tiles were downloaded from the U.S. Geological Survey and processed in HAZUS with LIDAR data sets to produce a seamless elevation layer. County LIDAR data sets were received as either LAS point cloud data files or digital elevation models derived from LAS points. For some counties, DEMS were hydro-flattened, while others were not. Hydro-flattening is the process of creating a LiDAR-derived DEM in which water surfaces appear / behave as they would in traditional topographic DEMs created from photogrammetric digital terrain models (DTMs). For counties with LIDAR-based DEMs which were not flattened and for which hydro break lines were available, manual hydro-flattening was conducted.

LIDAR data sets for the project area were produced by different vendors with widely varying standards and definitions with regards to how classes were derived. LIDAR-based DEMSs data were digitally combined to produce a project area mosaic. For all areas where LIDAR coverage was unavailable, supplemental NED 10m DEMs were used. Due to resolution differences between LIDAR-based DEMs and 10m NED data, the entire project area was resampled to a 5m cell size.



HYDRO-FLATTENING
Additional processing was done to several individual county LAS datasets through a process called hydro-flattening. Hydro flattening is a process in which break lines around bodies of water are generated as part of the LiDAR collection post-processing. These break lines identify areas where data collection identifies elevation variability over water bodies. These areas are then given a value at the shoreline (or a downstream trending value, in the case of a flowing river) and “flattened” to the given value. This eliminates any erroneous values that would otherwise disrupt the directional flow of a water body.

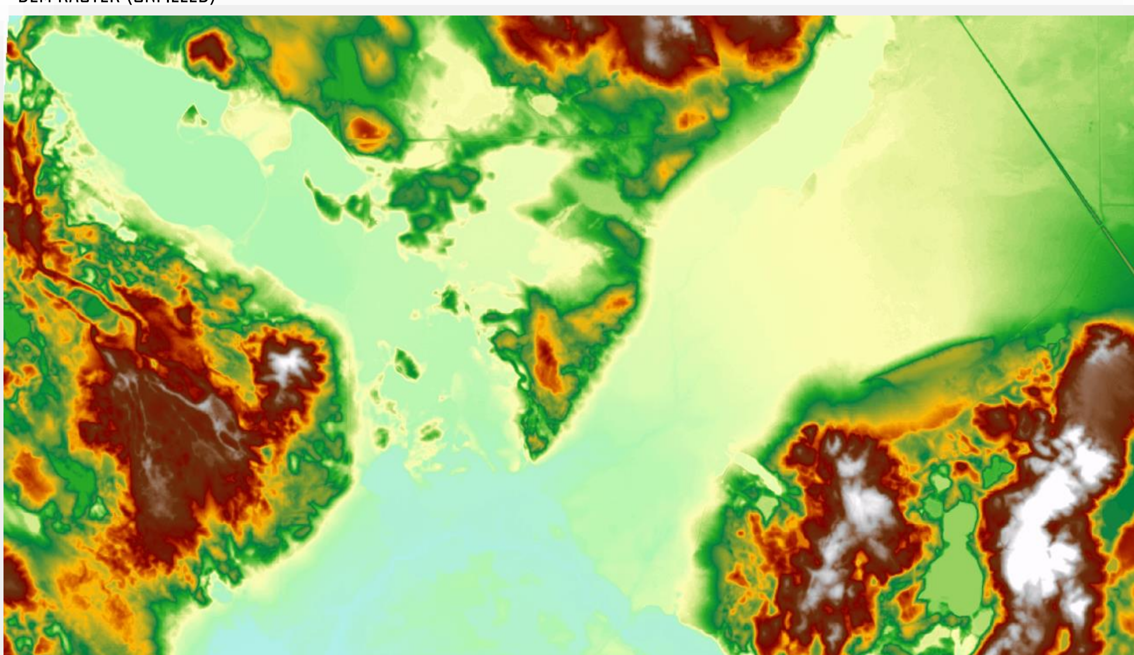
MOSAICING
Each county’s LiDAR data also had varying degrees of accuracy and data specifications. These disparate datasets needed to be merged into a single uniform contiguous dataset in order to develop a depth grid. Due to the lack of LiDAR data availability in The Western Upper Peninsula of Michigan, 1/3 arc-second National Elevation Dataset (NED) was substituted (which was necessary to complete Iron and Ashland County’s Analyses). A 5m cell size was chosen to for our elevation data. This means that each pixel in the elevation data was 5m x 5m on the ground. A

5m pixel size required us to develop our raw LIDAR data at 5m cells and re-sample our areas with NED coverage (10m cell size) to match our LIDAR data. Due to the varying collection methods and temporal differences of the individual county LiDAR datasets, there were varying degrees of cohesiveness between neighbor counties (or even states, as along the Minnesota/Wisconsin border). Based on how the LiDAR data had been post-processed (hydro-flattened vs. not hydro-flattened), some counties data had up to a 12m (40ft) of difference in elevation where it adjoined a neighbor county. These inaccuracies created artificial "walls" or "falls" across water bodies, which needed correction for creation of a depth grid. Erroneous elevation data was carefully removed from county datasets (where it existed) and was replaced by neighboring county data, which was more likely to contain accurate elevation values. Once the elevation inaccuracies were thoroughly cleaned, the data was mosaiced into a single seamless and contiguous surface. This elevation surface could then be run through FEMA's HAZUS-MH software to develop the 100-year and 500-year depth grids used in the analysis.

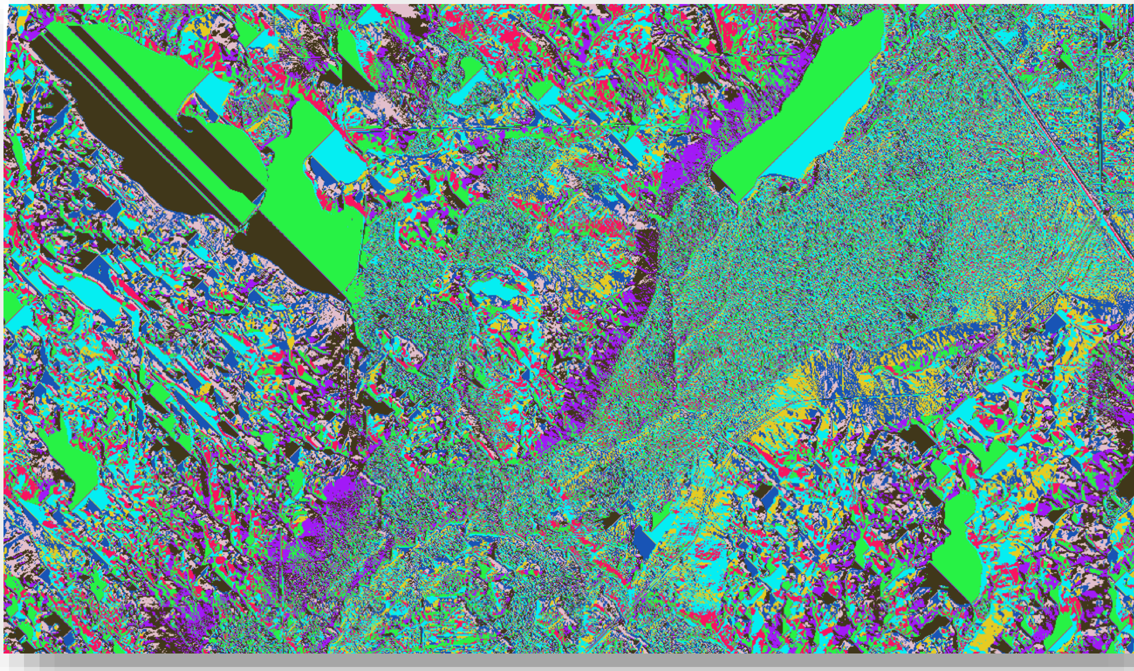
TERRAIN HYDROPROCESSING (PRE-PROCESSING)

Hydrologic conditioning (HC) is the process of modifying a digital elevation model (DEM) to alter flow routing and drainage. The most common practice of HC is to remove "digital dams" or barriers within the DEM that block the hypothetical flow of water typically associated with road crossings and other obstructions. One method of removing barrier features is to "burn" the stream through the obstruction to force flow downstream using "cutlines." Cutlines are manually placed in areas when an obstruction to flow occurs that should be "burned through". This will more accurately depict the flow of water over the earth's surface. Accurate elevation data is critical for this analysis to be accurate. The DEMs used in this report, were obtained from a variety of local, state and national datasets. Hydro conditioning was conducted using the

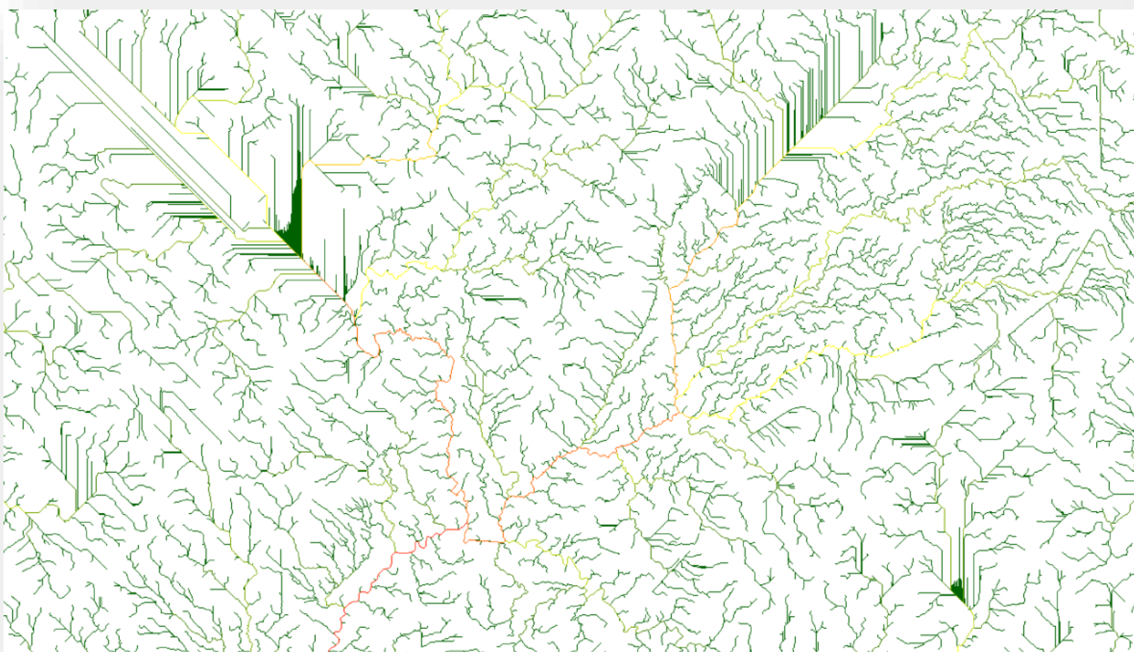
DEM RASTER (UNFILLED)



FLOW DIRECTION

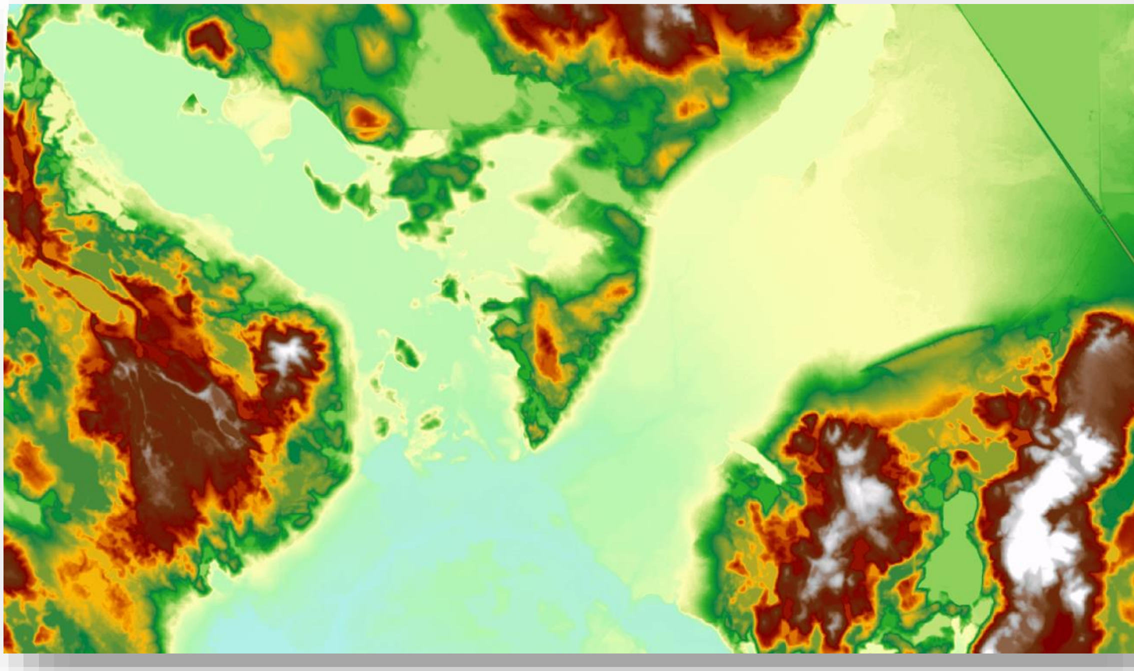


FLOW ACCUMULATION RASTER

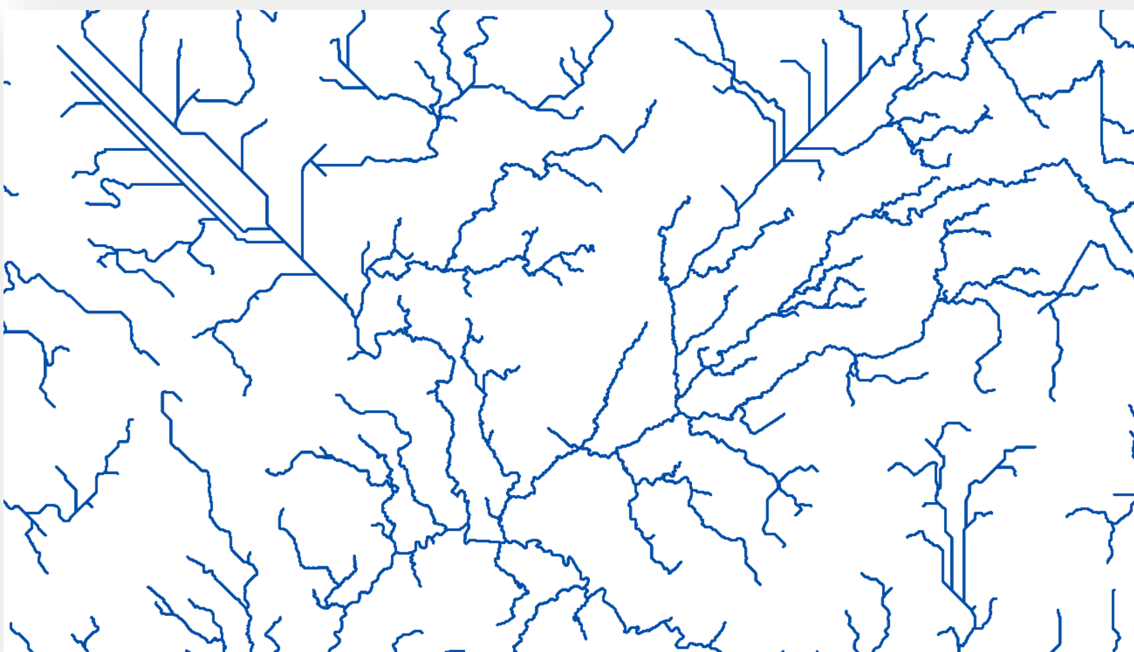


Agricultural Conservation Planning Framework (ACPF) GIS toolset, developed by the United States Department of Agriculture – Agricultural Research Service (USDA-ARS). Processing was conducted on the ArcGIS® 10.5.1 platform.

FILLED RASTER



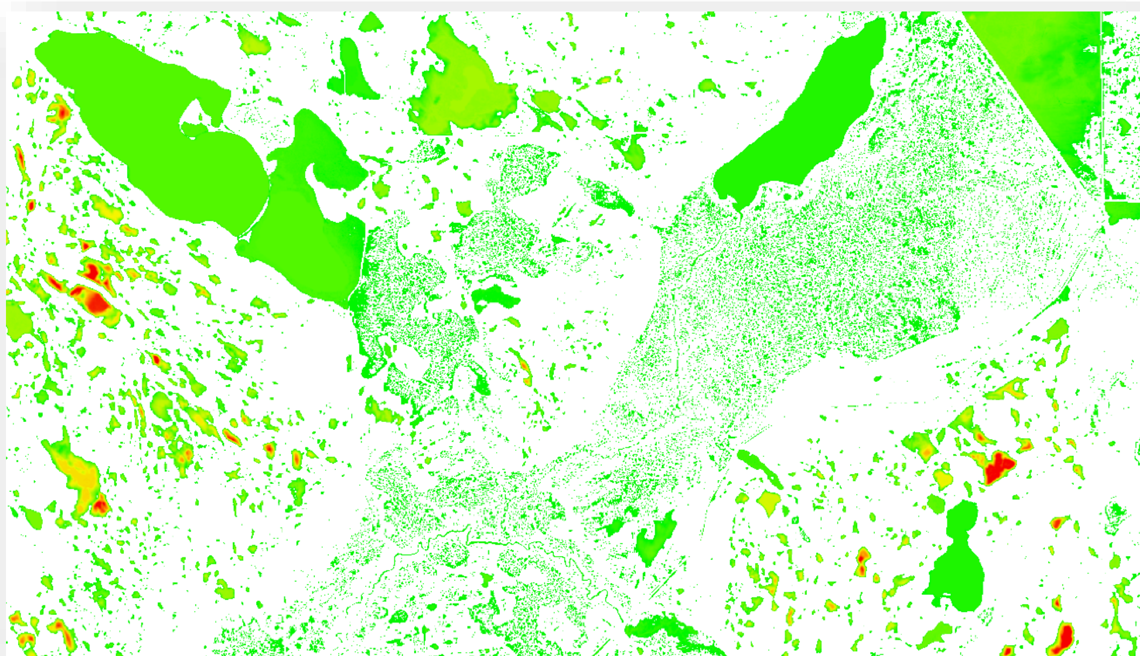
FLOW NETWORK



The first step of this process is to add the DEM raster file of the area that will be analyzed to ArcMap®. The DEM must be represented in meters for the following steps to work correctly. This allows the D8 Terrain Processing tool to be run. This tool only requires an unfilled DEM of

the Flood analysis area and performs a series of operations to derive key output layers which will be used in the cutline burning process. The D8 tool first performs a fill operation on the DEM which raises the elevation values within all the depressions so that so that water will "pour" out of any depression and will create a continuous flow network across the watershed. Second, the tool applies a D8 Flow Routing algorithm to the filled DEM to create a flow direction raster. Each pixel is assigned a number that is associated with a direction that the water is flowing. The next step uses the flow direction raster to generate a flow accumulation raster. This flow accumulation raster adds up all the contributing pixels that "flow" into other pixels. Lastly, the D8 Terrain processing tool creates a hillshade raster that is used for visual purposes when analyzing the DEM. The objective of the next step (Flow Network Definition) is to generate a Flow Network based on the flow direction and flow accumulation raster created by the first tool. A value of 10 acres was given to the area threshold which helps create a rough overlay of rivers and streams in the area. The smaller the threshold value, the more detailed the stream network will be. There is a fine line between being too detailed and being too broad. In glacial landscapes, like northwest Wisconsin, an area threshold of 10 acres is recommended.

DEPTH GRID RASTER



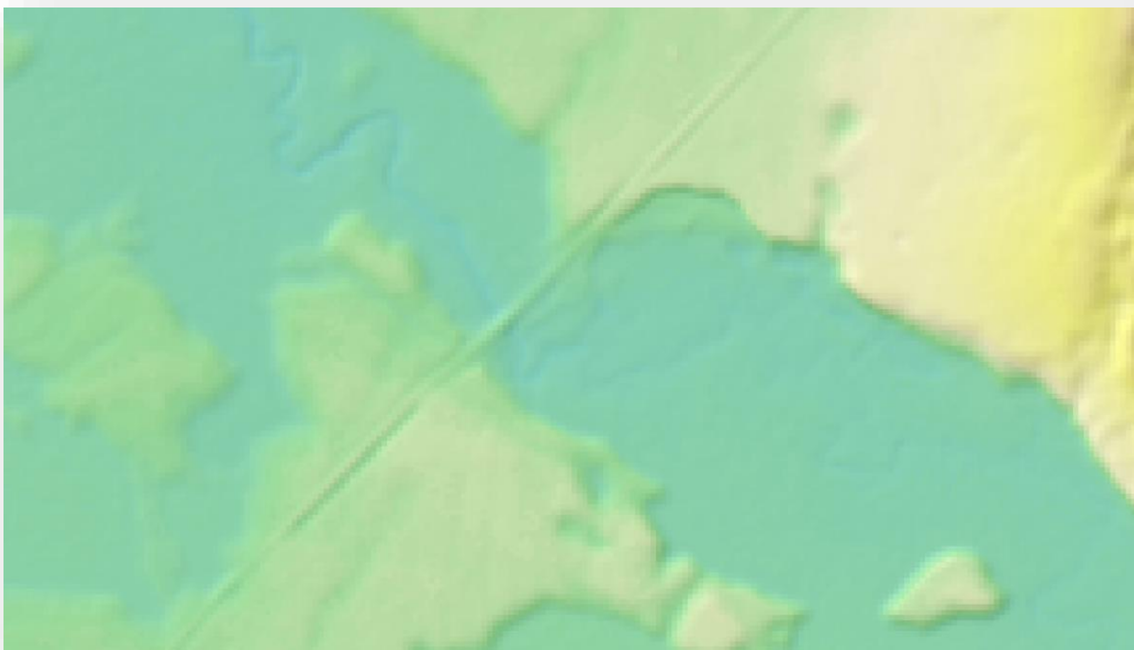
The third step involves using the Identify Impeded Flow tool to hydro-condition the original unfilled DEM raster. It is an iterative process by which the topographic data in the DEM is modified to more accurately represent water flow. This tool generates a depth grid raster that represents the differences between the unfilled and filled DEM developed in the previous terrain processing tool. The depth grid raster can be used as a visual aid for the manual hydro-conditioning process to identify obstructions to flow that should be "burned through" by placing cutlines. Several steps have to be taken before the final tool can be run. There are various layers that need to be added, as well as changes in symbology that will aid in the

identification of potential culvert locations. High quality aerial imagery, accurate road data and hydrology lines are added in ArcGIS®. Aerial imagery can help confirm whether a culvert is present or not. Updated road and stream data is also helpful in identifying road-stream crossings where a culvert is likely to be present.

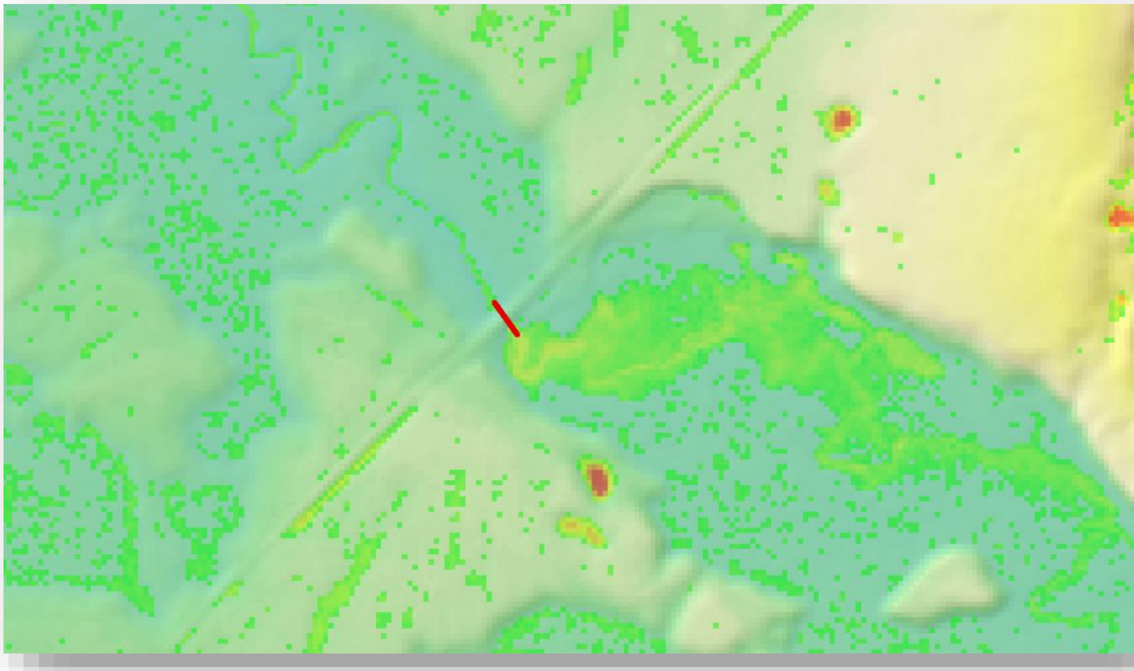
PLACING CUTLINES

Using the hillshade, DEM, depth grid raster, roads, and flowlines as a guide, cutlines were manually placed at locations where our data indicated the likely presence of a culvert. Cutlines were drawn from a *higher* to a *lower* elevation using the DEM to verify elevation. A new feature class was created containing the region-wide cutlines.

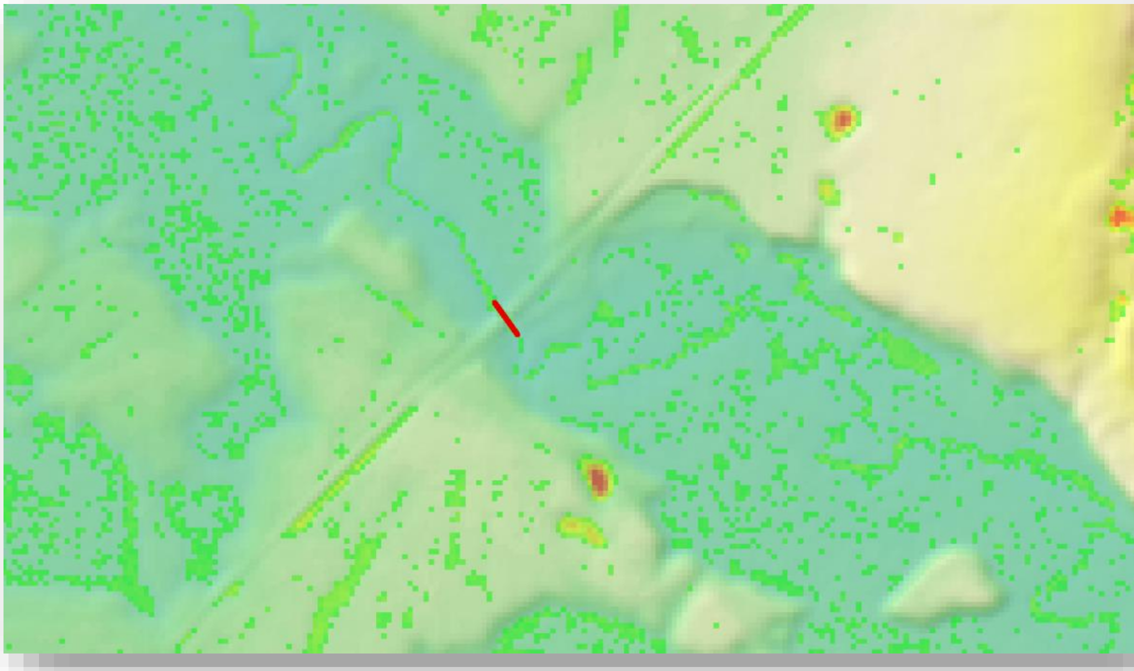
OBSTRUCTED FLOW (LIKELY CULVERT OR BRIDGE)



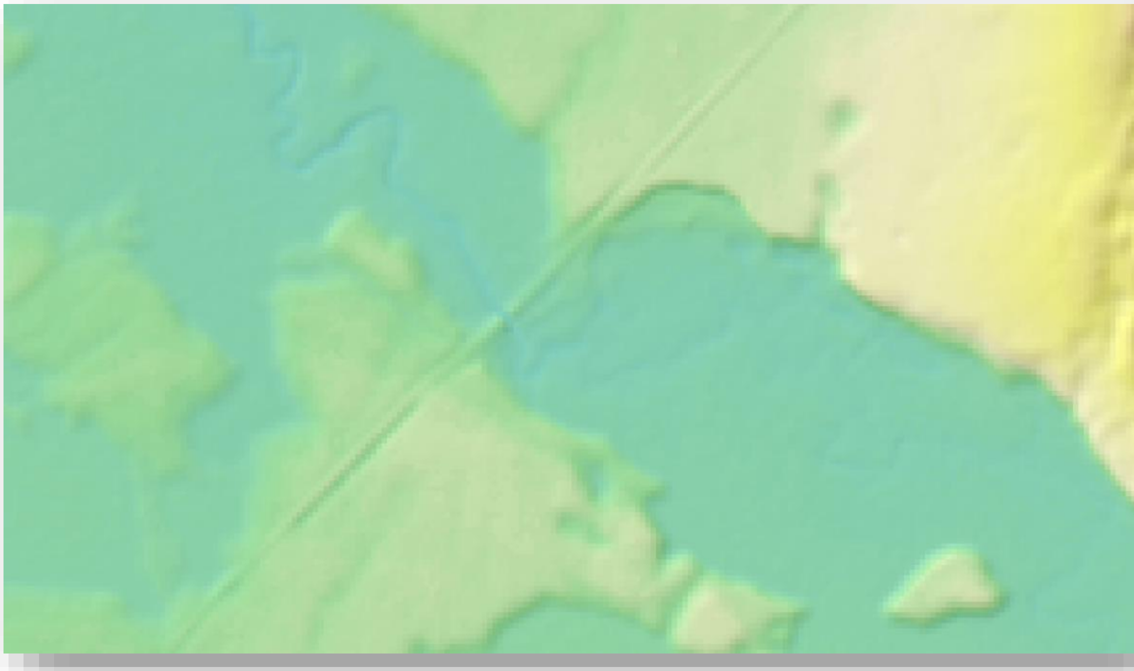
CUTLINE, WITH DEPTH GRID RASTER



FINAL DEM WITH CUTLINES (UPDATED DEPTH GRID)

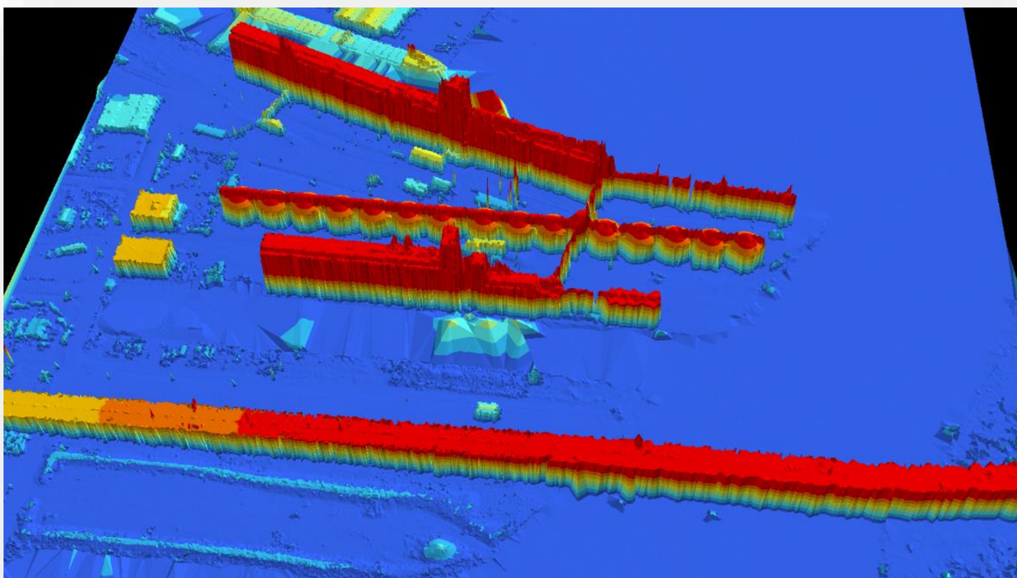


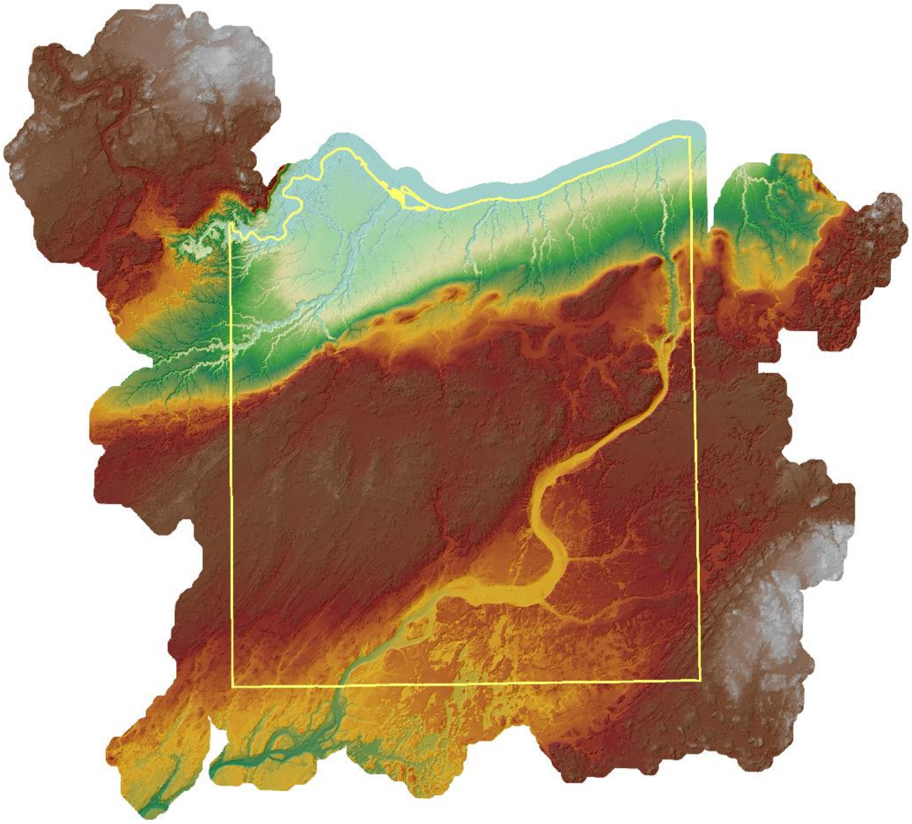
FINAL DEM WITH CULVERT "BURNED" INTO DEM



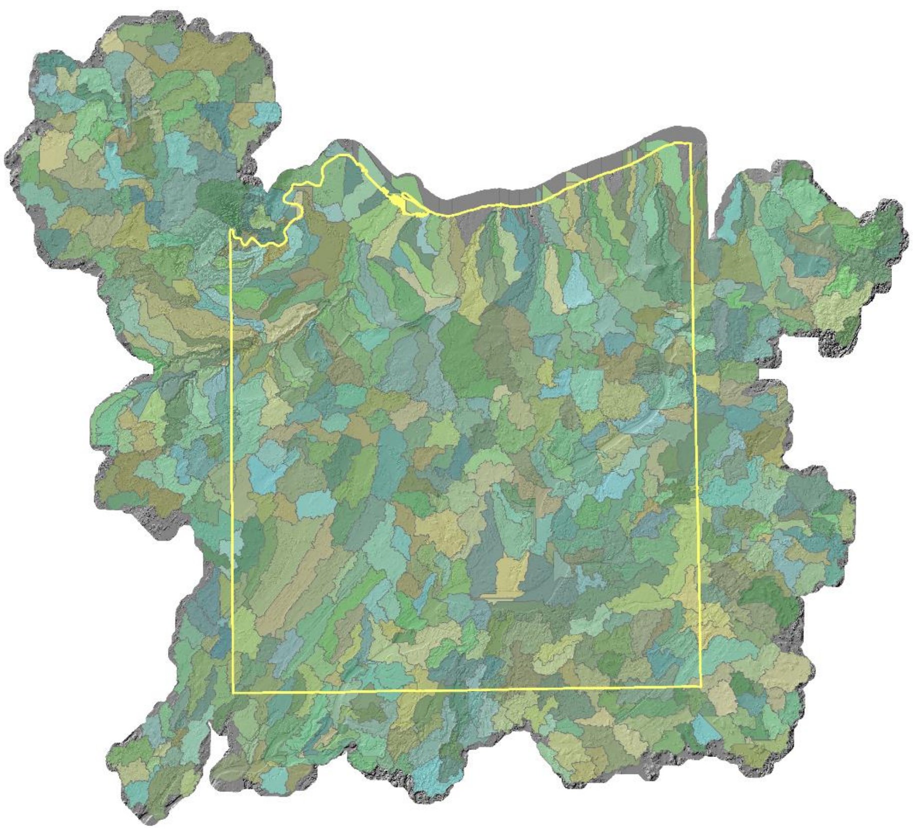
TERRAIN PROCCESSING (HAZUS-MH)

Due to the large file size of LIDAR-based DEMs and processing limitations of HAZUS-MH, terrain processing was conducted at the individual county scale. The project area composite DEM was used as the base elevation model from which each county study region was created. The HAZUS-MH flood hazard analysis consists of three stages: stream delineation, hydrologic analysis to determine stream discharge, and hydraulic analysis to determine flood depth and extent.



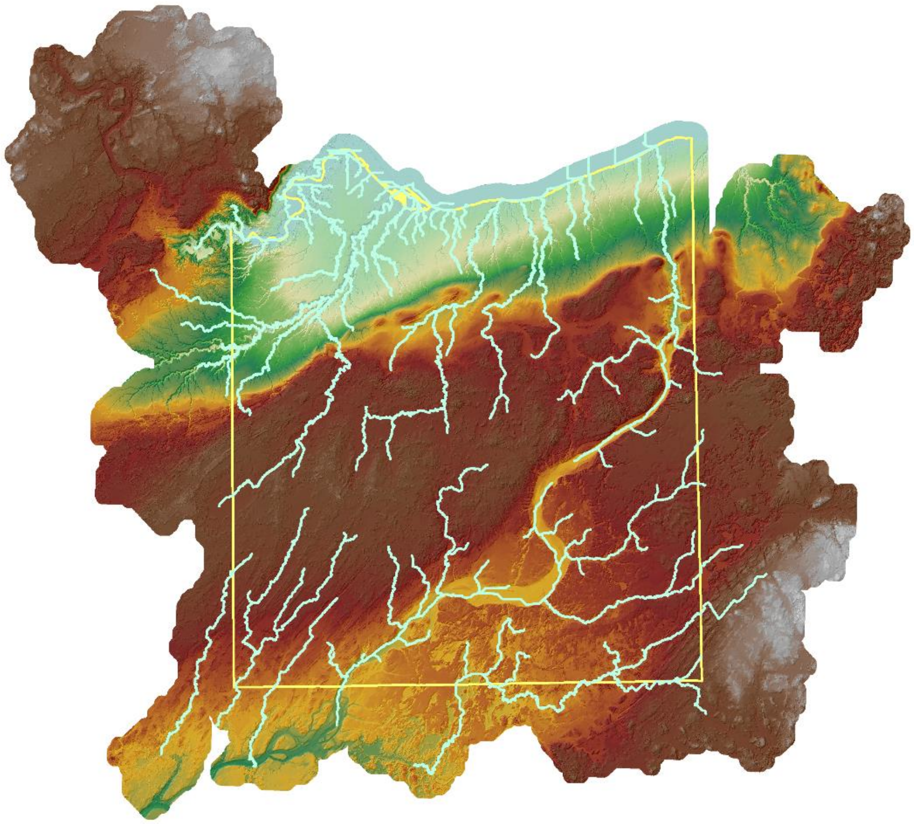


Study Region DEM
(Douglas County)



Study Region Watersheds

(Douglas County)



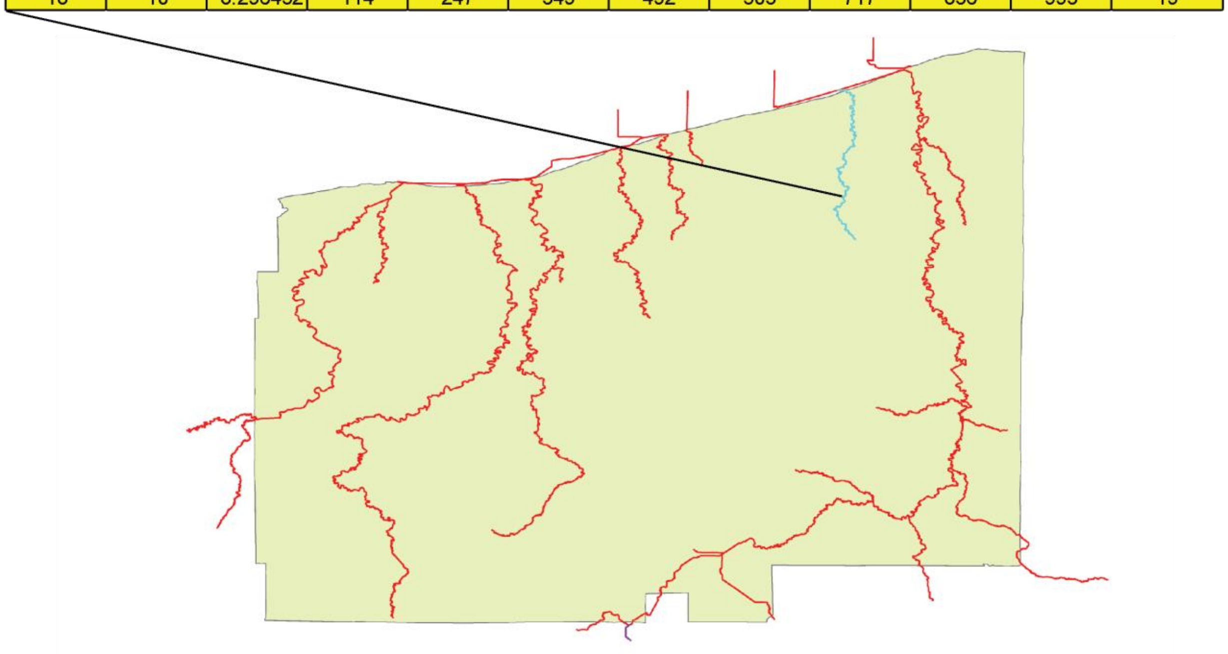
Delineating Stream Network
(Douglas County)

HAZUS-MH computes a synthetic stream network based on the drainage areas calculated from the DEM. An input for parameter for the threshold drainage area allows the user to define the minimum accumulation area draining to a stream network. The smaller the threshold drainage area, the more detailed the stream network generated in HAZUS. Processing time is also a consideration when using the complex and topographically detailed LIDAR-based DEMs. While using a very small drainage area (0.5 square miles) created a more detailed stream network, it also occasionally resulted in erroneous data when processing flood depth grids creating an artificial "gridding effect" in the output raster. Using a larger drainage area of 5.0 square miles proved to be most effective in characterizing rural stream networks, while reducing or eliminating the gridding effect. Using a 5 square mile drainage threshold value also produced a synthetic stream network which very accurately reflected the actual 1:24,000 stream network. For urban areas, the threshold drainage area was reduced to 0.5 square miles without generating the gridding effect, so it appears that region size and/or processing capability may be a limiting factor in determining optimal threshold drainage area.

HYDOLOGIC ANALYSIS

The objective of hydrologic analysis in HAZUS-MH is to calculate rainfall-runoff characteristics for watersheds and identify discharge values in streams. HAZUS-MH implements hydrologic analysis through built-in regression equations to determine discharge-frequency relationships for each reach and include gage and main stream adjustment. Regression equations within HAZUS-MH include derived variables including catchment area, mean catchment elevation and slope, and channel length; along with default localized parameters including temperature, precipitation, soil type, forest cover and snowfall. The HAZUS default database contains stream gage records from across the United States which are used to adjust the regression results based on comparison with other watersheds across the country with similar hydrologic characteristics. Upon completion of the hydrologic analysis, an output peak discharge table is generated with discharges computed at each reach's upstream and downstream nodes for return periods of 2, 5, 10, 25, 50, 100 and 500 years.

FLID	POINT	AREA	Q2	Q5	Q10	Q25	Q50	Q100	Q200	Q500	OBJECTID
17	9	6.873548	585	1210	1687	2365	2906	3460	3969	4584	18
18	10	8.296452	114	247	349	492	503	717	836	993	19

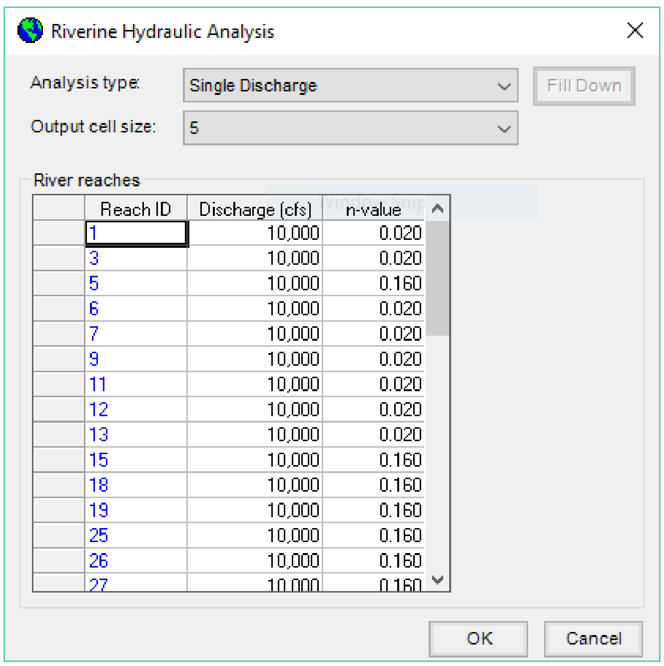


HYDRAULIC ANALYSIS

HAZUS-MH uses the derived discharge values and stream channel morphology calculated under the hydrologic analysis to compute flood elevations at stream cross-sections. Within HAZUS-MH, the hydraulic analysis is performed using Manning's equation with a friction slope equal to the slope of the reach to estimate flood elevations. Inputs include discharge, cross-section descriptions [channel slope, cross-section geometry and friction factors for inundated areas], and 2-D flow fields, varying Manning's n, bridge geometries, expansion/contraction coefficients and subcritical/super-critical flow. Outputs include flood elevations at cross-sections, energy head, flood velocity, flood depths and extents. The model is greatly simplified in HAZUS-MH.

Inputs include peak discharge, cross-section geometries, 1-D flow field and constant Manning's n for sub-critical flow. Only flood elevations at cross-sections, flood depth and extent grids are generated.

HAZUS estimates the initial floodplain by buffering the reaches [buffer distance = 10 * Q0.5]. Flow centerlines are determined and cross-section lines are placed normal to the flow centerline at intervals of 1000 feet. Manning's equation determines the flood elevations at the stream cross-sections and HAZUS interpolates elevations between cross-sections to create a flood surface. DEM z (height) values are subtracted from the flood surface elevation to produce a flood depth grid, which depicts inundation areas and the estimated depth of floodwater along corresponding reaches.



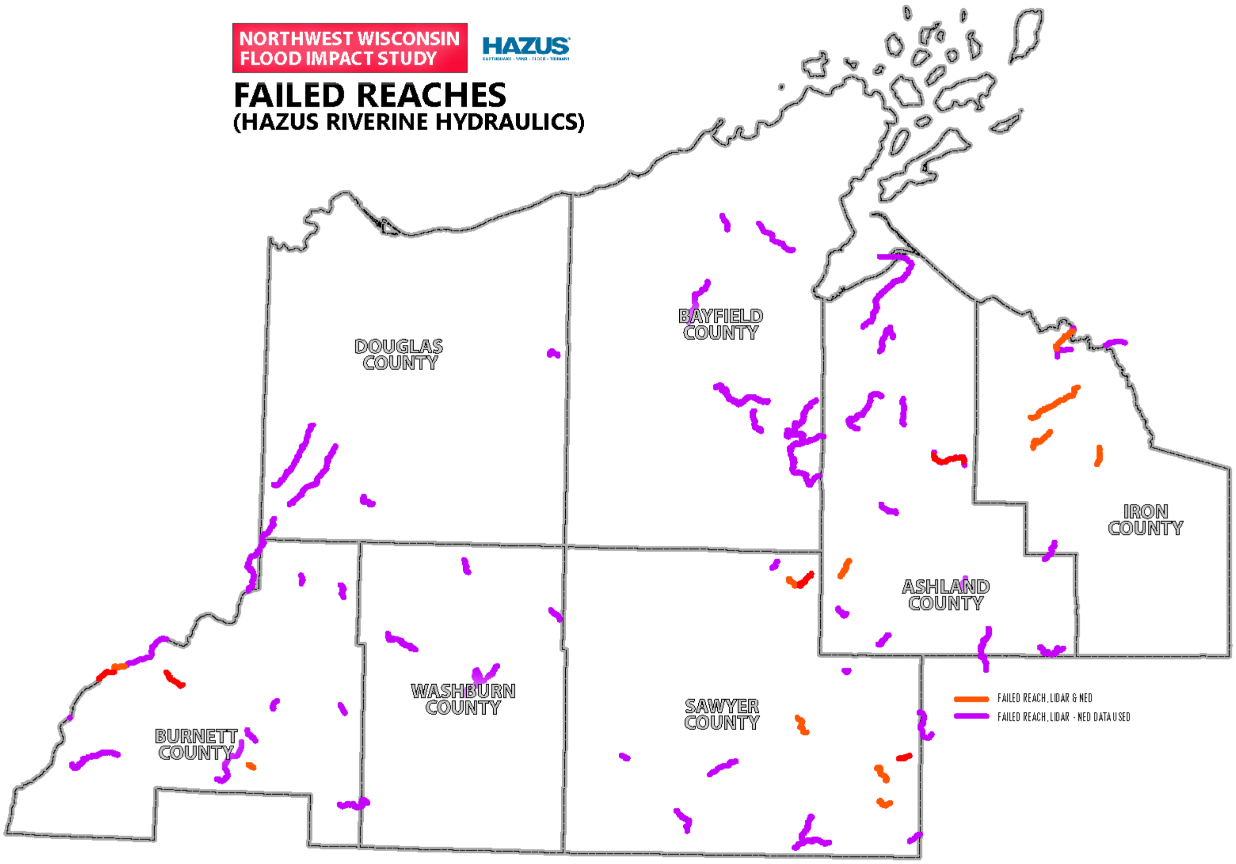
HAZUS-MH allows for the incorporation if user-defined depth grids from third-party sources, such as Hydrologic Engineering Centers River Analysis System (HEC-RAS) files or depth grids interpolated from FEMA Digital Flood Insurance Rate Maps.

Hydraulic analysis may be performed for a single return period, multiple return periods or for a specific discharge, if available. USGS stream gage sites typically collect discharge data, which can be used to interpolate projected inundation for a given river stage. Unfortunately, this region of Wisconsin – while having an abundance of rivers and streams – has relatively few stream gages. There are 45 gage sites with a historical record varying from 192 to 32,300 day and 12 active recording sites within the seven-county project area.

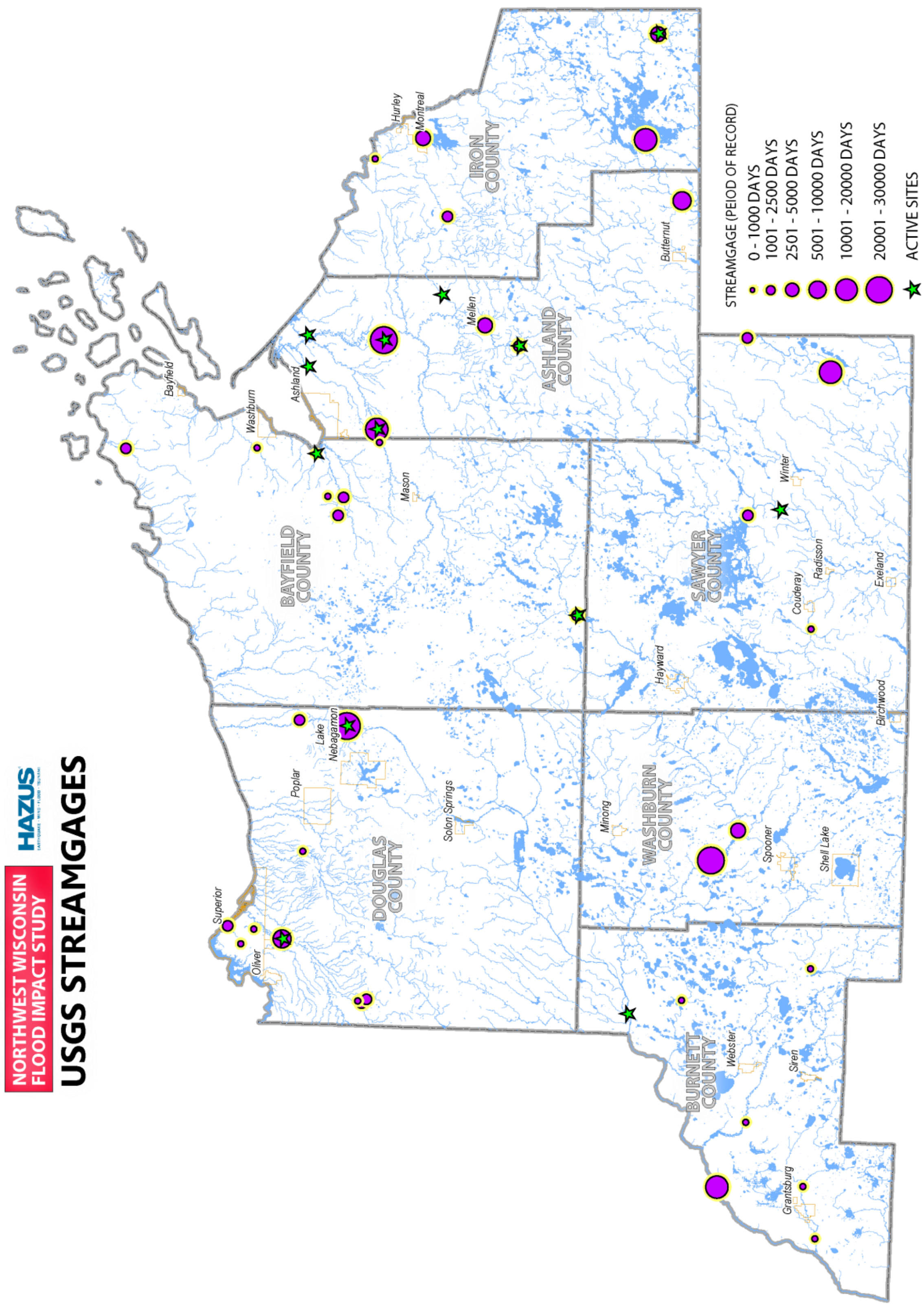
Failed Reaches

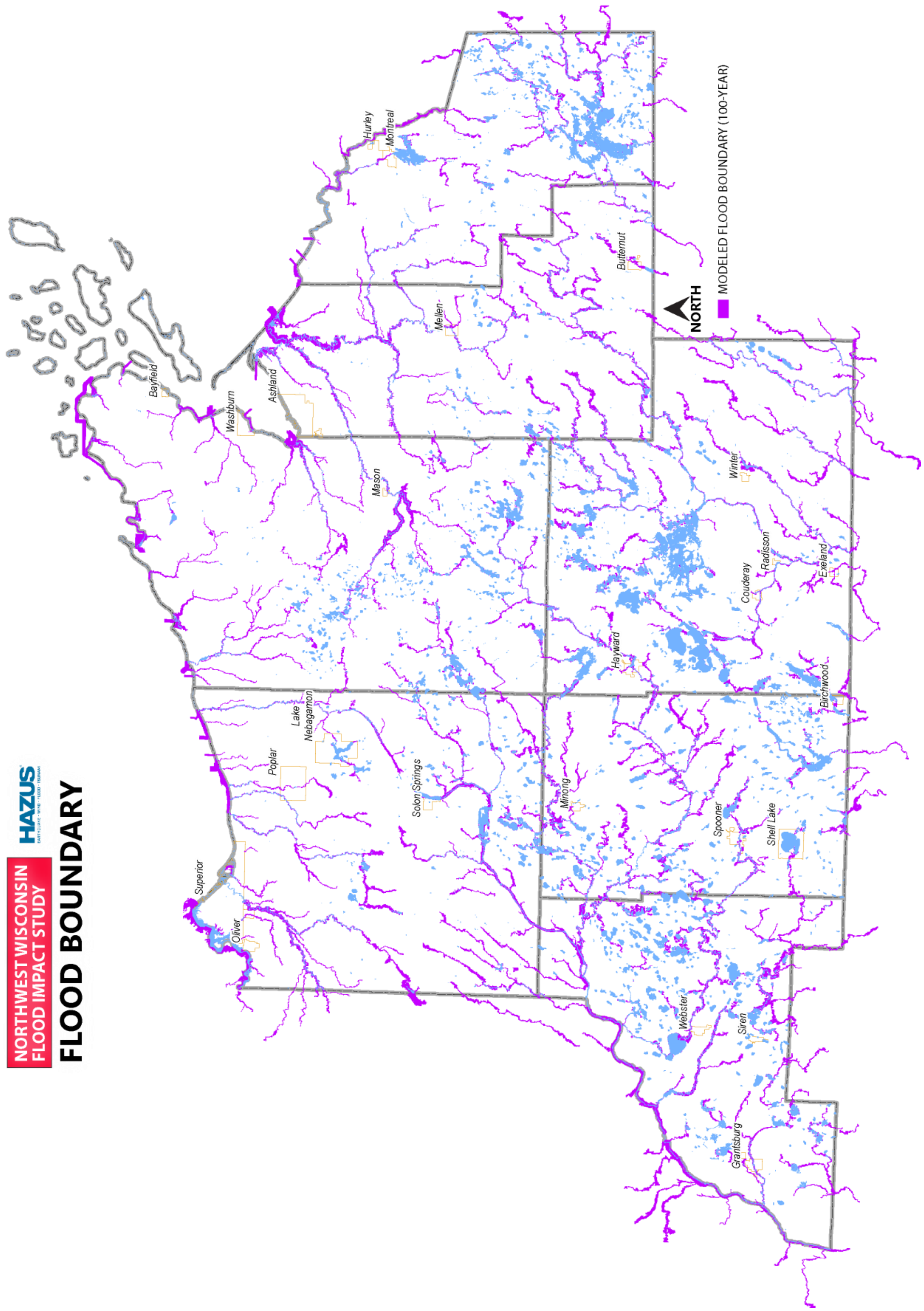
In running the riverine hydraulic analysis using HAZUS-MH, there were river reaches that the software was unable to process. These are considered failed reaches, with not output generated. HAZUS-MH developers classify failed reaches as "*…reaches that have been processed in the hydraulics process, but for some reason, do not produce a flood depth grid.*"[1] In lieu of the software not being able to build a depth grid for these reaches (using the 5m LiDAR data), portions of a previously developed depth grid, using 10m USGS National Elevation Dataset (NED), were used as surrogates. These 10m reaches were resampled down to a 5m cell size to match the LiDAR generated depth grid. There were also a few cases where the reach processing failed in both the 5m and the 10m scenarios. In these cases, no depth grid was available for these reaches. The distribution of failed reaches, by return period, is illustrated in the table below.

[1] HAZUS-MH User Manual, p 3-71



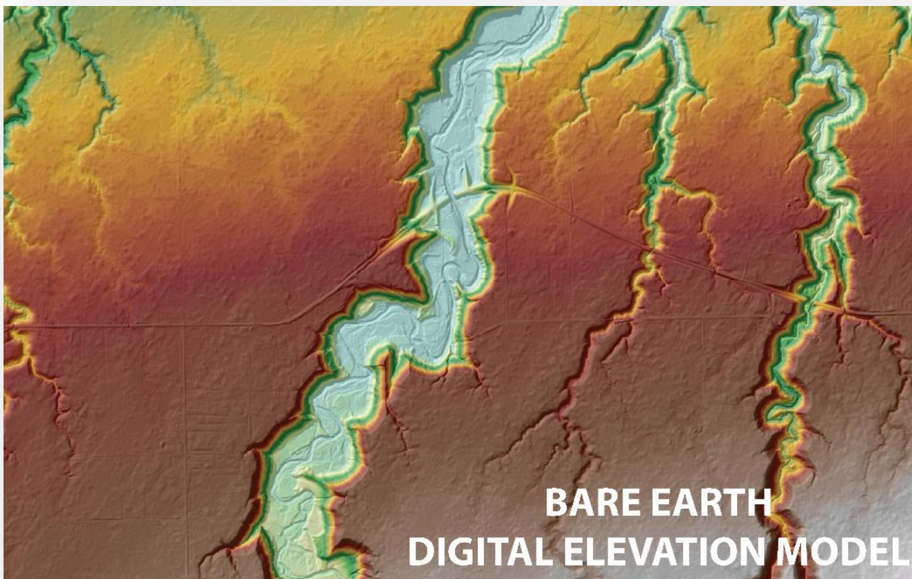
Return Period	Reaches failed in LiDAR Elevation Data	Reaches failed in LiDAR & NED Elevation Data
100- Year Flood Event	39	12
500-Year Flood Event	56	5

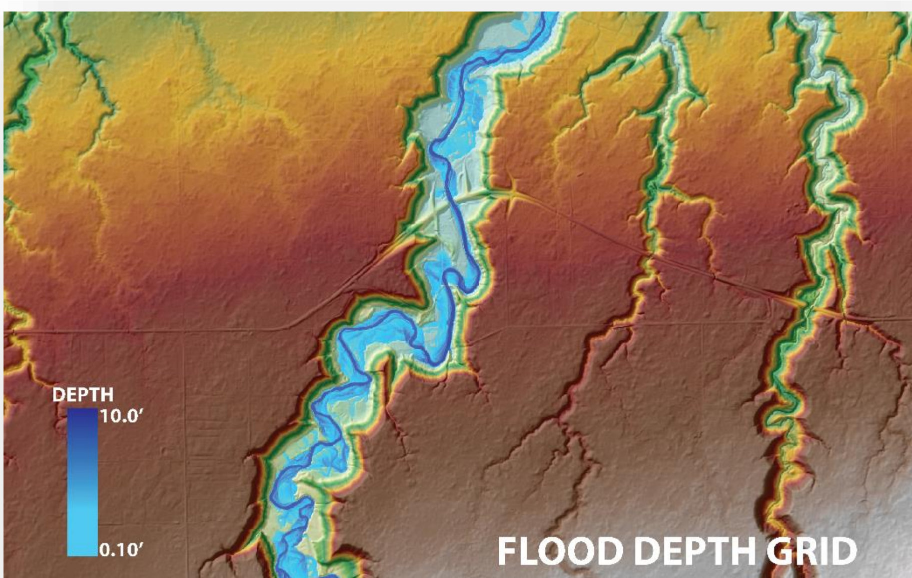

NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
USGS STREAMGAGES
BAYFIELD COUNTY
DOUGLAS COUNTY
ASHLAND COUNTY
IRON COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
Superior
Oliver
Poplar
Lake Nebagamon
Solon Springs
Bayfield
Washburn
Ashland
Mason
Mellen
Hurley
Montreal
Butternut
Hayward
Winter
Radisson
Couderay
Exeland
Birchwood
Minong
Spooner
Shell Lake
Webster
Siren
Grantsburg
STREAMGAGE (PEIOD OF RECORD)
0 - 1000 DAYS
1001 - 2500 DAYS
2501 - 5000 DAYS
5001 - 10000 DAYS
10001 - 20000 DAYS
20001 - 30000 DAYS
ACTIVE SITES


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
FLOOD BOUNDARY
NORTH
MODELED FLOOD BOUNDARY (100-YEAR)
Hurley
Montreal
Butternut
Mellen
Bayfield
Washburn
Ashland
Mason
Winter
Radisson
Couderay
Exeland
Hayward
Birchwood
Lake Nebagamon
Poplar
Solon Springs
Minong
Spooner
Shell Lake
Superior
Oliver
Webster
Siren
Grantsburg

FLOOD DEPTH GRIDS

A HAZUS-MH flood depth grid is created by subtracting (cell-by-cell) the ground elevation, contained in the DEM grid, from the flood elevations at cross sections. This raster data set contains grid cells which depict the depth of water (in feet) within the inundation zone (flood hazard boundary).



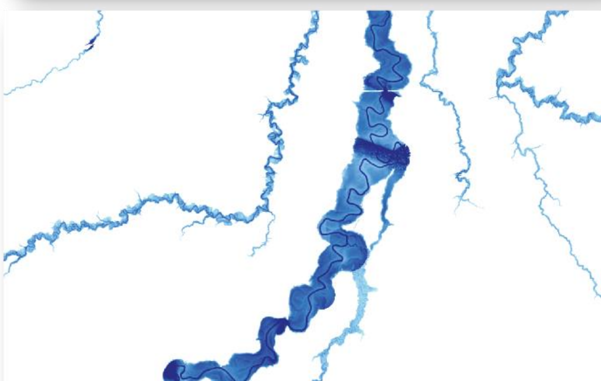


DEPTH GRID ANOMALIES

Overall, depth grid generation in HAZUS-MH met expectations relative to the spatial area of inundation and flood depth.

Random depth grid features
Isolated, disconnected areas generated by HAZUS-MH in the riverine hydraulics process. In this example, the area in question is disconnected from adjacent hydrology and modeled flood depth is dramatically inconsistent with nearby areas. This modeled feature also indicates some degree of clipping. Where encountered, these areas were manually removed from the flood depth grid.

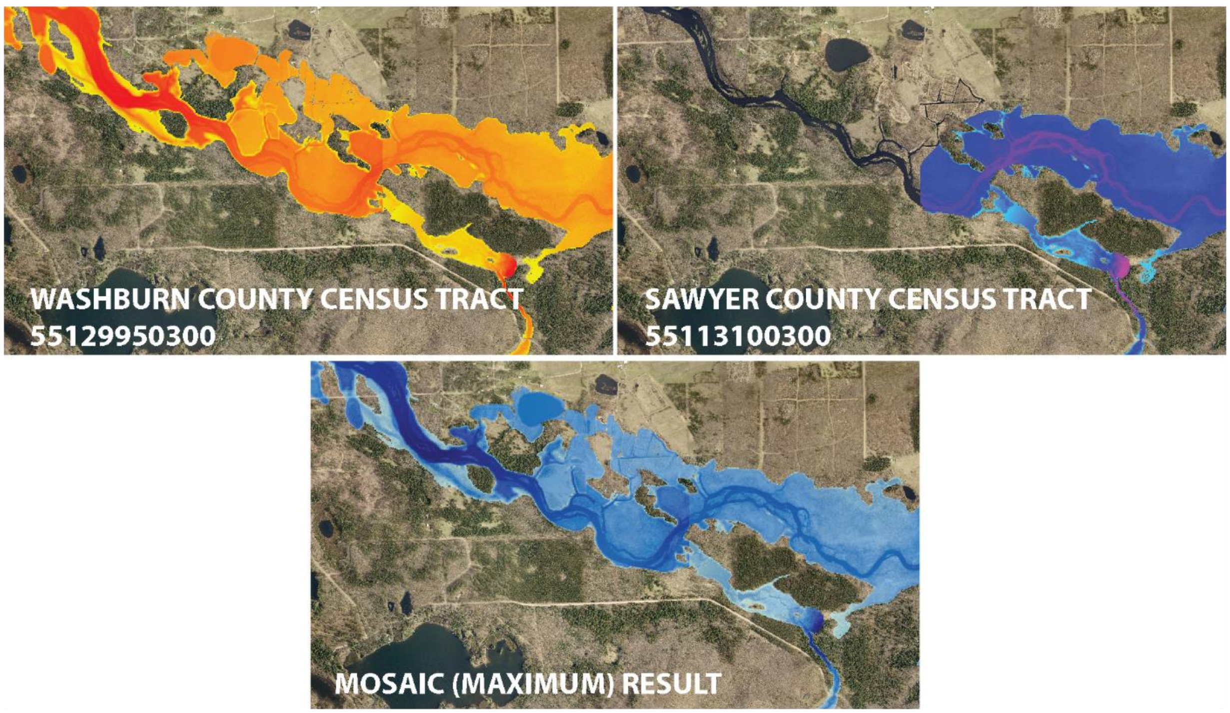
Clipping
Areas where no flood depth grid was generated in HAZUS-MH. Missing areas are often exhibit elements of symmetry not typically encountered in natural features. In this example, the depth grid appears to be clipped in alignment with a squared feature. These areas were not removed from the flood depth grids or altered. Based on consultation with the FEMA HAZUS-MH Help Desk, it appears that these anomalies may be due to processing limitations within the HAZUS-MH software.



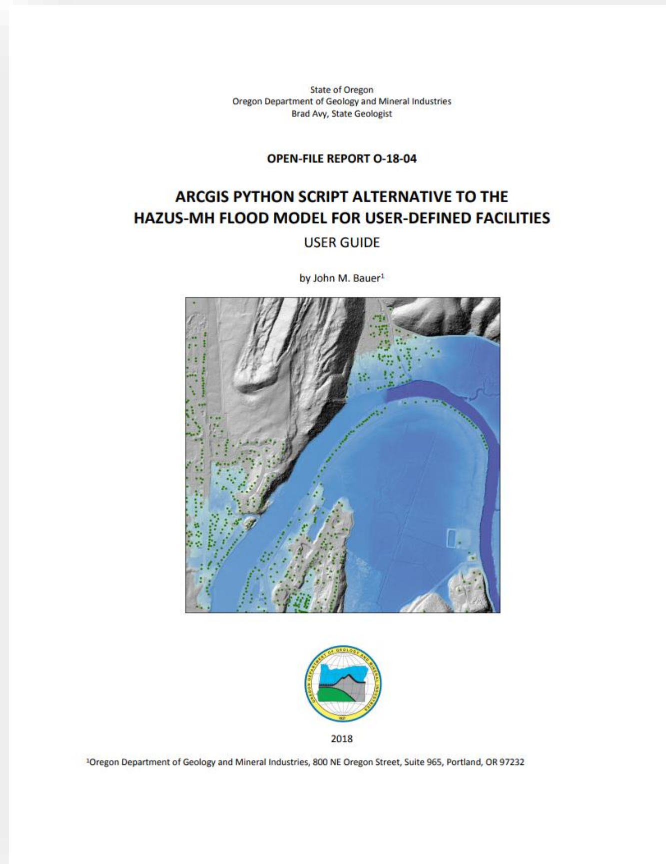
Banding
Unusual variations in the flood depth grid where unexpected changes in inundation depth are indicated. In some cases, banding does occur at locations where cut lines were placed. This expected to some degree as the flow is being constricted to the width of the cut line drawn. Other banding errors appear to be random and are not associated with the placement of cut lines. These areas were not removed from the flood depth grids or altered.

DEPTH GRID MOSAIC PROCESS

Due to processing limitations within HAZUS-MH, a single region-wide depth grid could not be created using the software. The data set was too large and the software's memory limitations were exceeded. The HAZUS-MH support help desk advised to either increase the cell size of our elevation data (lowering its resolution, in which case LIDAR data would cease to be relevant) or break the region into smaller sections, and develop the depth grids individually. To develop a regional depth grid, the hydraulic and hydrological processing was completed at the census tract level, by county, and the cities and villages were processed individually. Once these individual depth grids were completed, they were mosaiced together, using a mosaic method in which the largest cell value (or flood depth) was used for areas with overlapping coverage.



LOSS ESTIMATION


State of Oregon
Oregon Department of Geology and Mineral Industries
Brad Avy, State Geologist

OPEN-FILE REPORT O-18-04

ARCGIS PYTHON SCRIPT ALTERNATIVE TO THE
HAZUS-MH FLOOD MODEL FOR USER-DEFINED FACILITIES
USER GUIDE

by John M. Bauer[1]

2018

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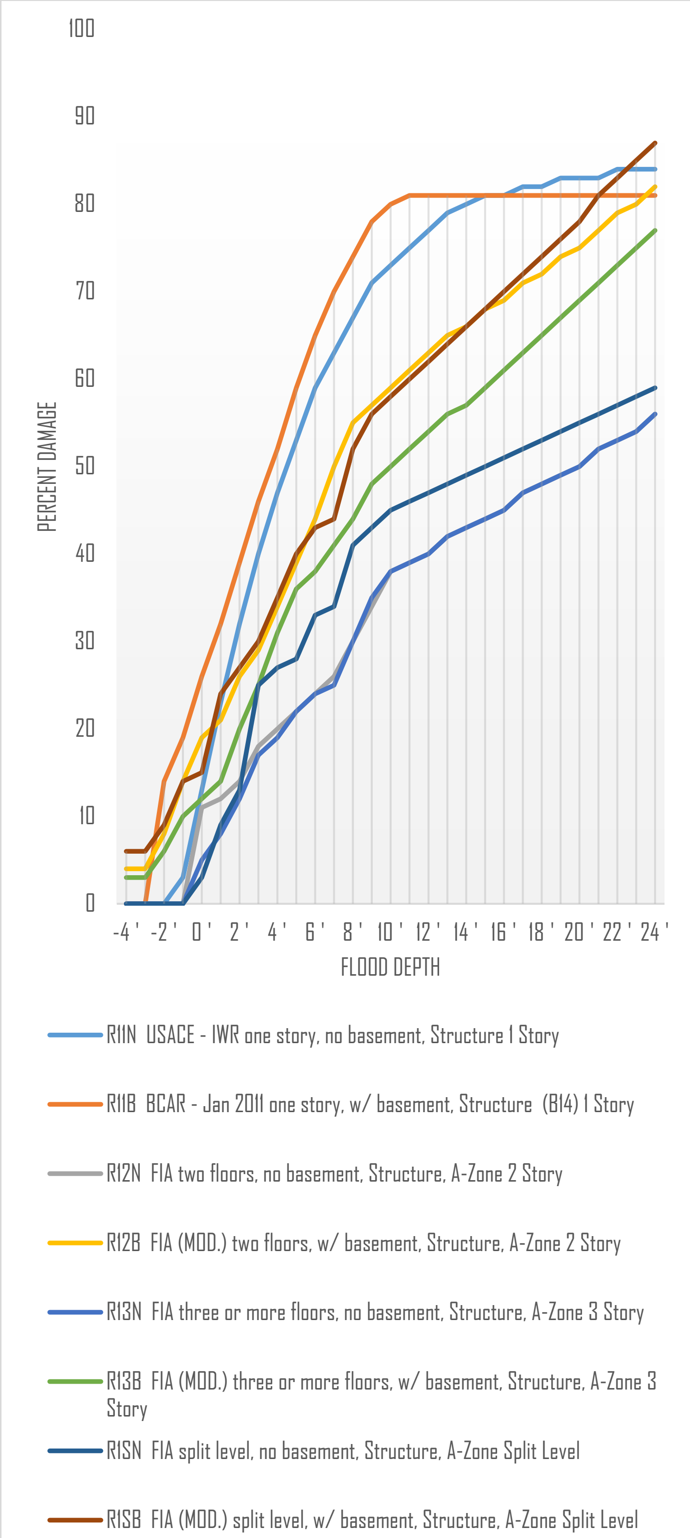
Loss estimation modelling was conducted using an ArcGIS® Python® Script developed by the Oregon Department of Geology and Mineral Industries (DOGAMI). Developed in 2018, this script uses the Python programming language to estimate losses from user defined features (UDFs). It was developed specifically for users of high-resolution depth grids, developed from LIDAR data. Using this script allowed our analysis workflow several time saving measures, over the traditional HAZUS-MH method. These improvements included eliminating the creation of duplicate data and geoprocesses, bypassing entry of our UDFs into the HAZUS Comprehensive Data Management System (CDMS) for standardization, and processing power. The script analyzes UDFs at roughly 10 times the speed of using the HAZUS-MH software. Like HAZUS-MH, the script calculates damages to buildings, content, & inventory through depth damage functions and also models debris generation. The script was developed using identical methodology for assessing damage to UDFs and debris generation, as outlined in the HAZUS technical manual (FEMA, 2011). However, the DOGAMI does not take into account the analysis of the default HAZUS-MH essential facilities inventory. Our research found the default HAZUS-MH inventory lacking for our region and we developed our own essential facility and infrastructure inventories. The inventories we developed are more robust, complete, and spatially accurate than the inventories included in the HAZUS-MH software. In addition to damage and debris generation, the DOGAMI script also calculates minimum and maximum replacement time (in days), adding a time element to the analysis. This replacement time analysis is not available using HAZUS-MH.

DAMAGE-DEPTH FUNCTIONS

Figure 11: DAMAGE DEPTH CURVES, RESIDENTIAL 1 OCCUPANCY CLASS



In the DOGAMI script, flood damages to structures are estimated based on building values (estimated fair market value) and flood depth. The script uses the same flood depth damage functions (DDF's) as HAZUS-MH and can be customized if supplemental local information is available. Damage depth curves for use structure type and occupancy class to estimate the percent of the building value that is damaged. Flood depth damage curves relate feet of inundation with percent of building damage depending on the structure type and occupancy class. These curves are derived from national data; however, because the curves are applied to regional building types and basin specific hydrology, the results are applicable to the basin. Content and inventory damages are based on structure value (fair market value) and the type of structure evaluated.

Flood depth grids created in HAZUS-MH were imported into the DOGAMI script, along with user defined facility (UDF) point files. UDF point data contained structure attribute information needed to execute the analysis, including occupancy class, foundation type, building height (stories) and content values (fair market value). The script then processed the input data to derive loss estimates.

RESULTS SUMMARY

The analysis concluded that 1,022 structures would be impacted under the 100-year scenario and 1,318 structures under the 500-year scenario. A 100-year flood has an annual exceedance probability of 1%, meaning it's likely to occur once every 100 years. The annual exceedance probability of a 500-year flood is 0.2%, meaning an event at this magnitude is likely to occur once every 500 years. Regionwide, loss estimates under the 100-year scenario were $15.2M and $24.0M under the 500-year scenario. The model estimates that 12 critical community assets/facilities would be impacted under the 100-year scenario and 17 under the 500-year scenario.

Table 5: ESTIMATED LOSSES BY COUNTY, 100-YR FLOOD EVENT

County	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
ASHLAND	92	$ 582,162	$ 456,098	$ 47,840	1,002
BAYFIELD	78	$ 796,776	$ 340,749	$ -	1,139
BURNETT	138	$ 2,034,886	$ 923,344	$ 31,034	1,508
DOUGLAS	67	$ 644,579	$ 632,320	$ -	506
IRON	45	$ 399,383	$ 579,651	$ 113,681	682
SAWYER	396	$ 7,640,836	$ 5,867,389	$ 204,919	6,001
WASHBURN	206	$ 3,129,779	$ 1,865,586	$ 41,355	2,205
GRAND TOTAL	**1022**	**$ 15,228,401**	**$ 10,665,137**	**$ 438,829**	**13,043**

Table 6: ESTIMATED LOSSES BY COUNTY, 500-YR FLOOD EVENT

County	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
ASHLAND	114	$ 875,091	$ 738,537	$ 124,599	1,408
BAYFIELD	114	$ 1,610,034	$ 611,690	$ 207	1,848
BURNETT	180	$ 2,767,118	$ 1,449,384	$ 39,815	1,993
DOUGLAS	100	$ 1,120,682	$ 733,852	$ -	943
IRON	48	$ 249,664	$ 196,964	$ 9,924	443
SAWYER	475	$ 11,874,777	$ 8,857,823	$ 318,409	12,054
WASHBURN	287	$ 5,500,003	$ 3,629,578	$ 188,619	3,493
GRAND TOTAL	**1,318**	**$ 23,997,369**	**$ 16,217,828**	**$ 681,573**	**22,182**

Table 7: ESTIMATED LOSSES BY OCCUPANCY CLASS, 100-YR FLOOD EVENT

Occupancy Class	Ashland	Bayfield	Burnett	Douglas	Iron	Sawyer	Washburn	Grand Total
AGR1							6	6
COM1	3		2		4	6	3	18
COM10							1	1
COM2	1				1		5	7
COM3	3	1	3			2	10	19
COM4						5	1	6
COM8	2	6	1	5	2	18	4	38
EDU1							3	3
GOV1	3	3	1			4	8	19
GOV2			1			2		3
IND2	5					1		6
REL1				1			3	4
RES1	66	62	124	55	36	326	143	812
RES2	6	2	4	5		5	2	24
RES3A	2							2
RES3D	1							1
RES4		4	2	1	2	26	17	52
RES6						1		1
TOTAL	**92**	**78**	**138**	**67**	**45**	**396**	**206**	**1022**

Roughly 80 percent of the potentially affected structures are single family homes (RES1). Estimated impacts to businesses were notable in both return periods, with more than 8 percent of potentially affected structures classified as either commercial or industrial. Most businesses potentially impacted tend to be small businesses (COM 8, entertainment & recreation), although some larger businesses were also identified. Potential impacts to general government services (GOV1) include wastewater treatment facilities, town halls, Wisconsin Department of Natural Resource facilities and park/recreation assets. Critical assets which are potentially impacted include electrical substations and dams.

Table 8: ESTIMATED LOSSES BY OCCUPANCY CLASS, 500-YR FLOOD EVENT

Occupancy Class	Ashland	Bayfield	Burnett	Douglas	Iron	Sawyer	Washburn	Grand Total
AGR1						2	9	11
COM1	3	1	2		1	5	8	20
COM10							1	1
COM2	1		1				5	7
COM3	3	1	3			1	14	22
COM4	1					6	1	8
COM5	1					1	1	3
COM8	4	7	2	4	2	23	6	48
EDU1							3	3
GOV1	5	3	2			4	9	23
GOV2			1			2		3
IND2	6	1				2		9
IND6							1	1
REL1			1	1			3	5
RES1	82	92	161	87	40	384	206	1052
RES2	5	3	3	6	1	12	3	33
RES3A	2							2
RES3D	1							1
RES4		6	4	2	4	32	17	65
RES6						1		1
TOTAL	**114**	**114**	**180**	**100**	**48**	**475**	**287**	**1318**

STRUCTURES IMPACTED

This value represents a count of the number of buildings which intersect the flood depth grid for a given return period. In some cases, buildings may intersect the flood boundary but have no projected losses. In these cases, the estimated depth of inundation was insufficient to cause damage.

ESTIMATED BUILDING LOSSES

The estimated direct economic losses to buildings associated with a given return period. Building values were derived from tax assessment data using the "estimated fair market value" parameter. Estimated Fair Market Value is calculated by dividing the properties total assessed valued by the average assessment ratio for the municipality. Damage-depth functions within the model correlate inundation depth from the flood depth grid with the estimated percent structure damage derived from the damage-depth curve. The estimated percent damage is multiplied by the estimated fair market value to obtain the building loss statistic.

ESTIMATED CONTENT LOSSES

Building content values are estimated using a multiplier value which is based on occupancy class. The multiplier is applied to the estimated fair market value to derive an estimate of the value of personal property contained within the structure. The default HAZUS-MH DDF lookup table contains the damage-depth curve data used to estimate content losses. Like building loss estimation, content losses are estimated based on flood depth and occupancy class.

Estimated Fair Market Value x Content Value Multiplier = **Estimated Content Value**

Estimated Content Value x Content Loss Percent (from damage-depth curve) = **Estimated Content loss**

Table 9: ESTIMATED CONENT LOSSES

CODE	Occupancy Class	Contents Value (%)	CODE	Occupancy Class	Contents Value (%)
RES 1	Single Family Dwelling	50	**COM9**	Theaters	100
RES2	Mobile Home	50	**COM 10**	Parking	50
RKS3	Multi Family Dwelling	50	**IND1**	Heavy	150
RES4	Temporary Lodging	50	**IND2**	Light	150
RES5	Institutional Dormitory	50	**IND3**	Food/Drugs/Chemicals	150
RES6	Nursing Home	50	**IND4**	Metals/Minerals Processing	150
COM 1	Retail Trade	100	**IND5**	High Technology	150
COM2	Wholesale Trade	100	**IND6**	Construction	100
COM3	Personal and Repair Services	100	**AGR1**	Agriculture	100
COM4	Professional/Technical	100	**REL1**	Church/Membership	100
COM3	Banks	100	**GOV1**	General Services	100
COM6	Hospital	150	**GOV 2**	Emergency Response	150
COM7	Medical Office/Clinic	150	**EDU1**	Schools/Libraries	100
COM8	Entertainment & Recreation	100	**HDU2**	Colleges/Universities	150

ESTIMATED INVENTORY LOSSES

Depending on Occupancy Class, the business Inventory Cost is calculated based on type of business and the building's square footage. To estimate business inventory losses, percent damage (determined from the depth-damage function) was multiplied by the total inventory value.

Area (square feet) x Annual Sales (per square foot) x Business Inventory Percent of Sales = **Inventory Cost**

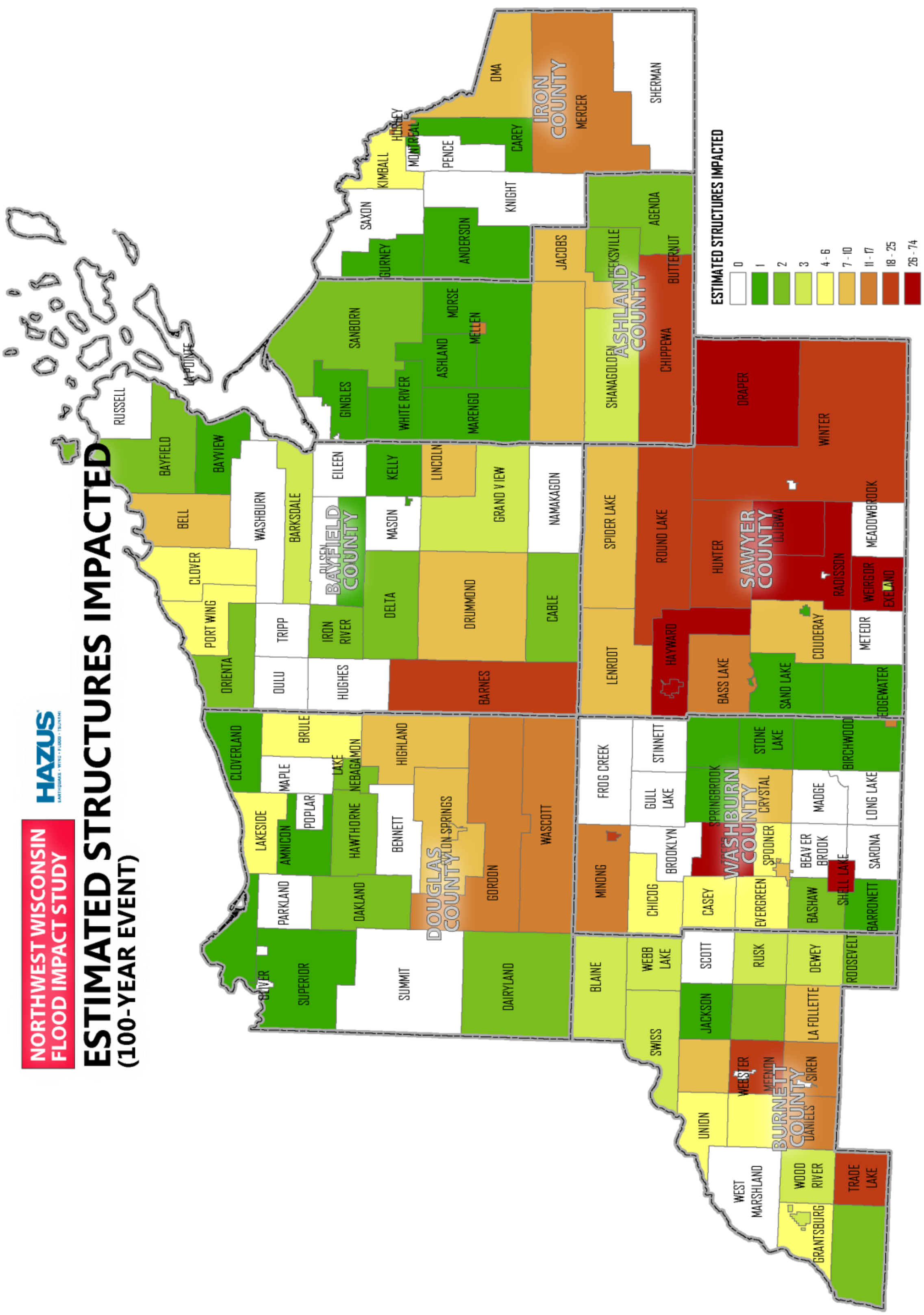
Inventory cost x Inventory Damage Percent (from damage-depth curve) = **Estimated Inventory loss**

Table 10: ESTIMATED INTENTORY LOSSES

Occupancy Class	Annual sales per square foot	Business Inventory percent of sales
AGR1	$ 148	8%
COM1	$ 53	13%
COM2	$ 77	10%
IND1	$ 713	5%
IND2	$ 226	4%
IND3	$ 697	5%
IND4	$ 656	3%
IND5	$ 437	4%
IND6	$ 768	2%

DEBRIS GENERATION

Debris removal includes the clearance, removal, and/or disposal of items such as trees, sand, gravel, building components, wreckage, vehicles, and personal property following a flood event. The HAZUS-MH damage-depth functions used by the DOGAMI script calculate **total debris** is a combination of finish, structure, and foundation debris estimates. This figure is based on occupancy class, square footage, foundation type, and depth-in-structure. Debris removal and cleanup costs vary based on location and the nature of debris materials. FEMA generally does not cover the costs associated with debris removal from private property.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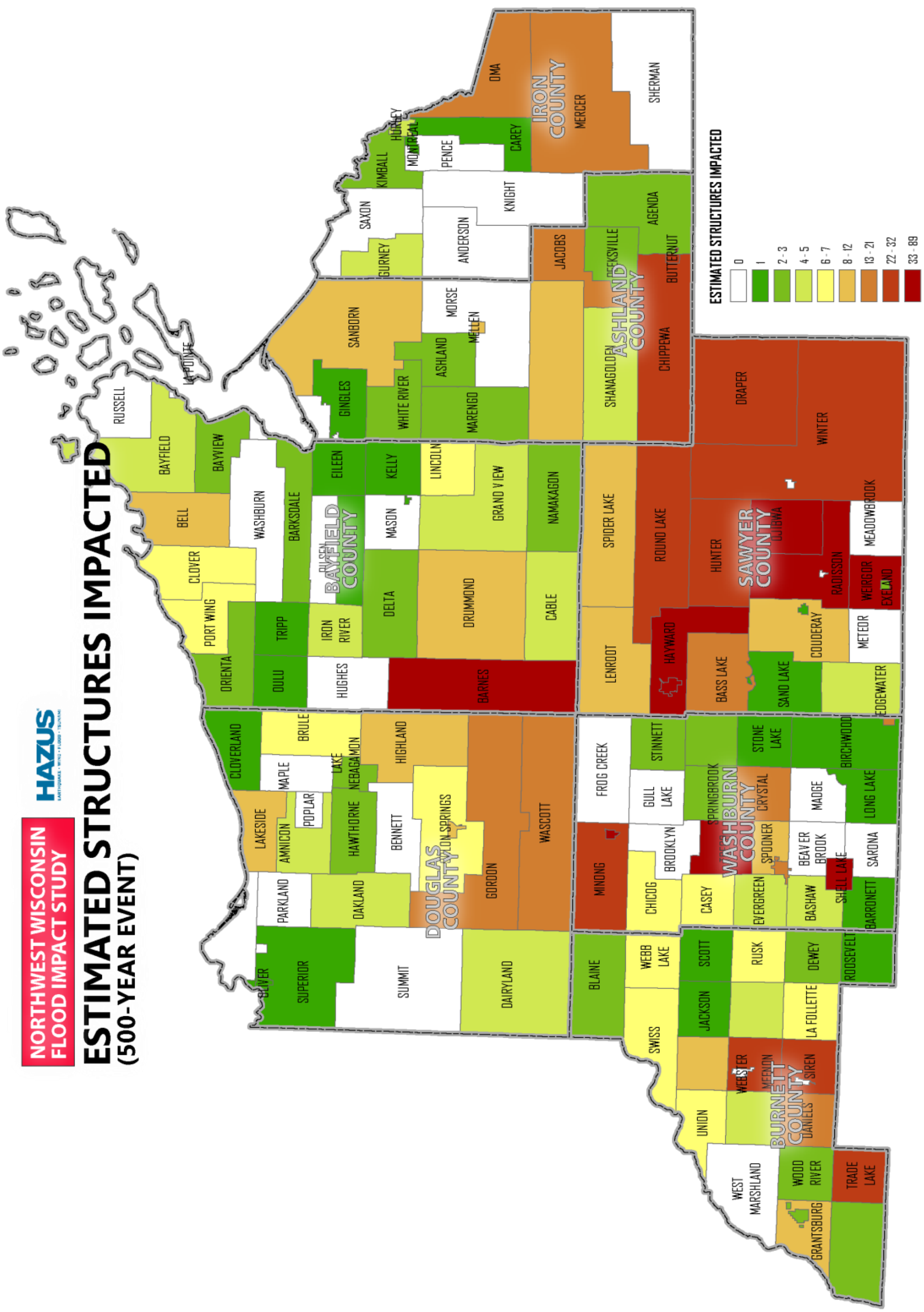
FLOOD IMPACT STUDY
ESTIMATED STRUCTURES IMPACTED
(100-YEAR EVENT)
BAYFIELD COUNTY
DOUGLAS COUNTY
ASHLAND COUNTY
IRON COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
ESTIMATED STRUCTURES IMPACTED
0
1
2
3
4 - 6
7 - 10
11 - 17
18 - 25
26 - 74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HAZUS
ESTIMATED STRUCTURES IMPACTED
(500-YEAR EVENT)
ESTIMATED STRUCTURES IMPACTED
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2 - 3
4 - 5
6 - 7
8 - 12
13 - 21
22 - 32
33 - 89
IRON COUNTY
ASHLAND COUNTY
BAYFIELD COUNTY
DOUGLAS COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
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MERCER
SHERMAN
CAREY
PENCE
KNIGHT
SAXON
KIMBALL
GURNEY
ANDERSON
JACOBS
AGENDA
BUTTERNUT
MORSE
MELLEN
SANBORN
ASHLAND
GINGLES
WHITE RIVER
MARENGO
SHANAGOLDEN
CHIPPEWA
RUSSELL
BAYFIELD
BAYVIEW
BELL
WASHBURN
BARKSDALE
EILEEN
KELLY
LINCOLN
MASON
GRAND VIEW
NAMAKAGON
CLOVER
PORT WING
ORIENTA
TRIPP
OULU
IRON RIVER
HUGHES
DELTA
DRUMMOND
CABLE
BARNES
SPIDER LAKE
ROUND LAKE
DRAPER
WINTER
HUNTER
OJIBWA
RADISSON
MEADOWBROOK
WEIRGOR
EXELAND
LENROOT
HAYWARD
BASS LAKE
SAND LAKE
COUDERAY
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FROG CREEK
STINNETT
GULL LAKE
SPRINGBROOK
STONE LAKE
BIRCHWOOD
CRYSTAL
MADGE
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SPOONER
BEAVER BROOK
SARONA
CHICOG
CASEY
EVERGREEN
BASHAW
SHELL LAKE
BARRONETT
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WEBB LAKE
SCOTT
RUSK
DEWEY
ROOSEVELT
SWISS
JACKSON
LA FOLLETTE
WEBSTER
MEENON
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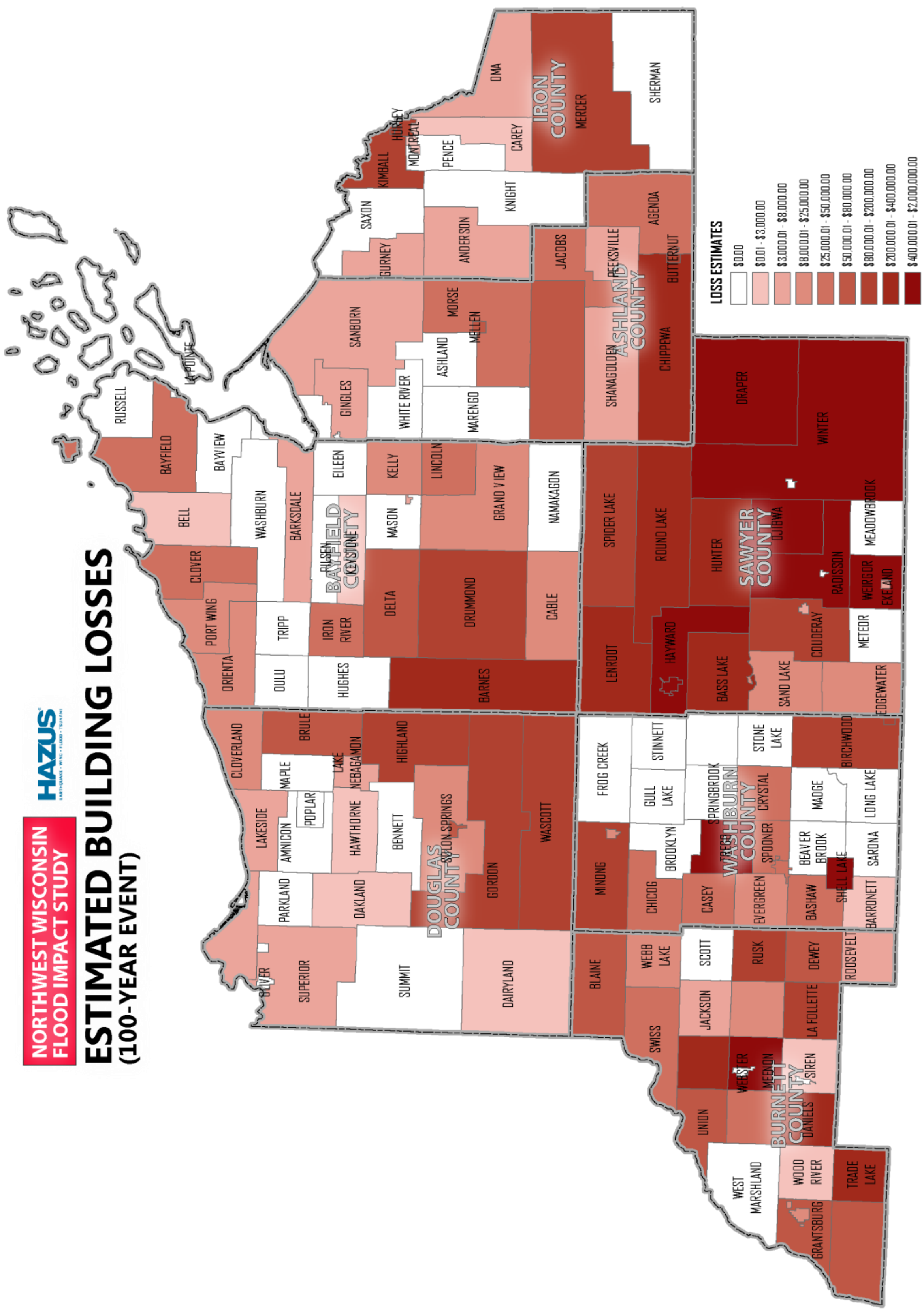
UNION
DANIELS
WEST MARSHLAND
WOOD RIVER
TRADE LAKE
GRANTSBURG


NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
ESTIMATED BUILDING LOSSES
(100-YEAR EVENT)
LOSS ESTIMATES
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$0.01 - $3,000.00
$3,000.01 - $8,000.00
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SAWYER COUNTY
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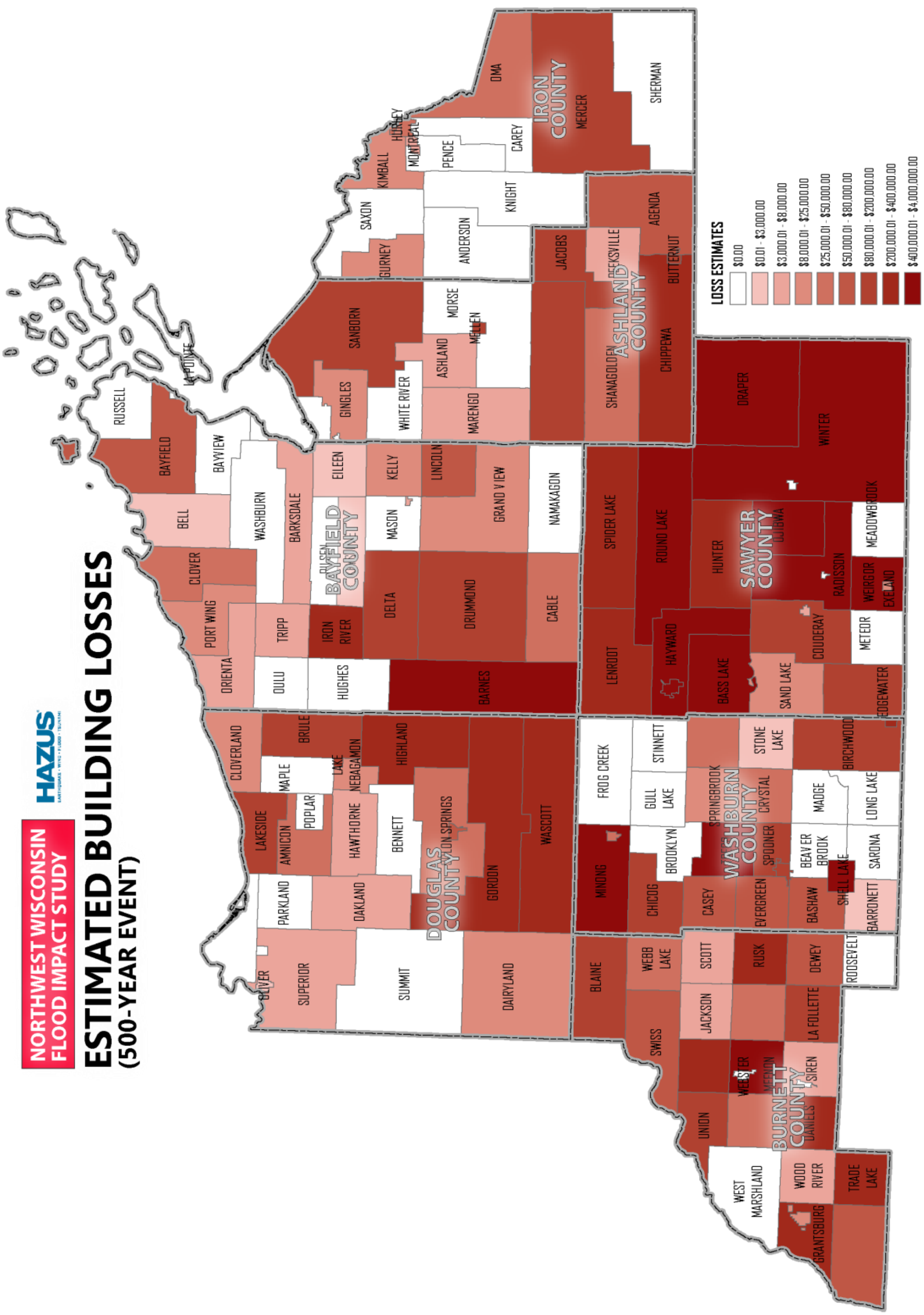
WASHBURN COUNTY
BURNETT COUNTY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ESTIMATED BUILDING LOSSES
(500-YEAR EVENT)
LOSS ESTIMATES
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WASHBURN COUNTY
BURNETT COUNTY
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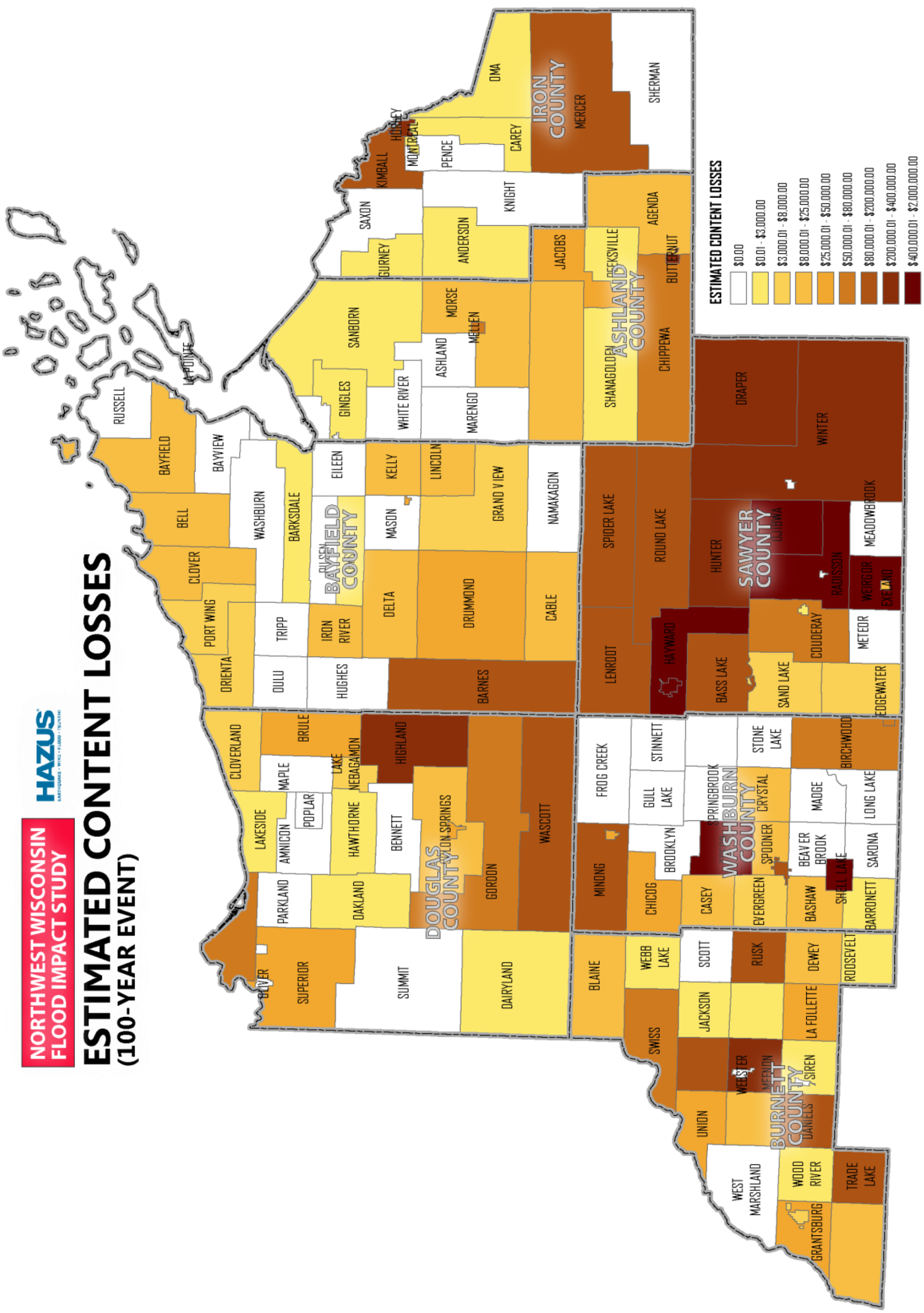
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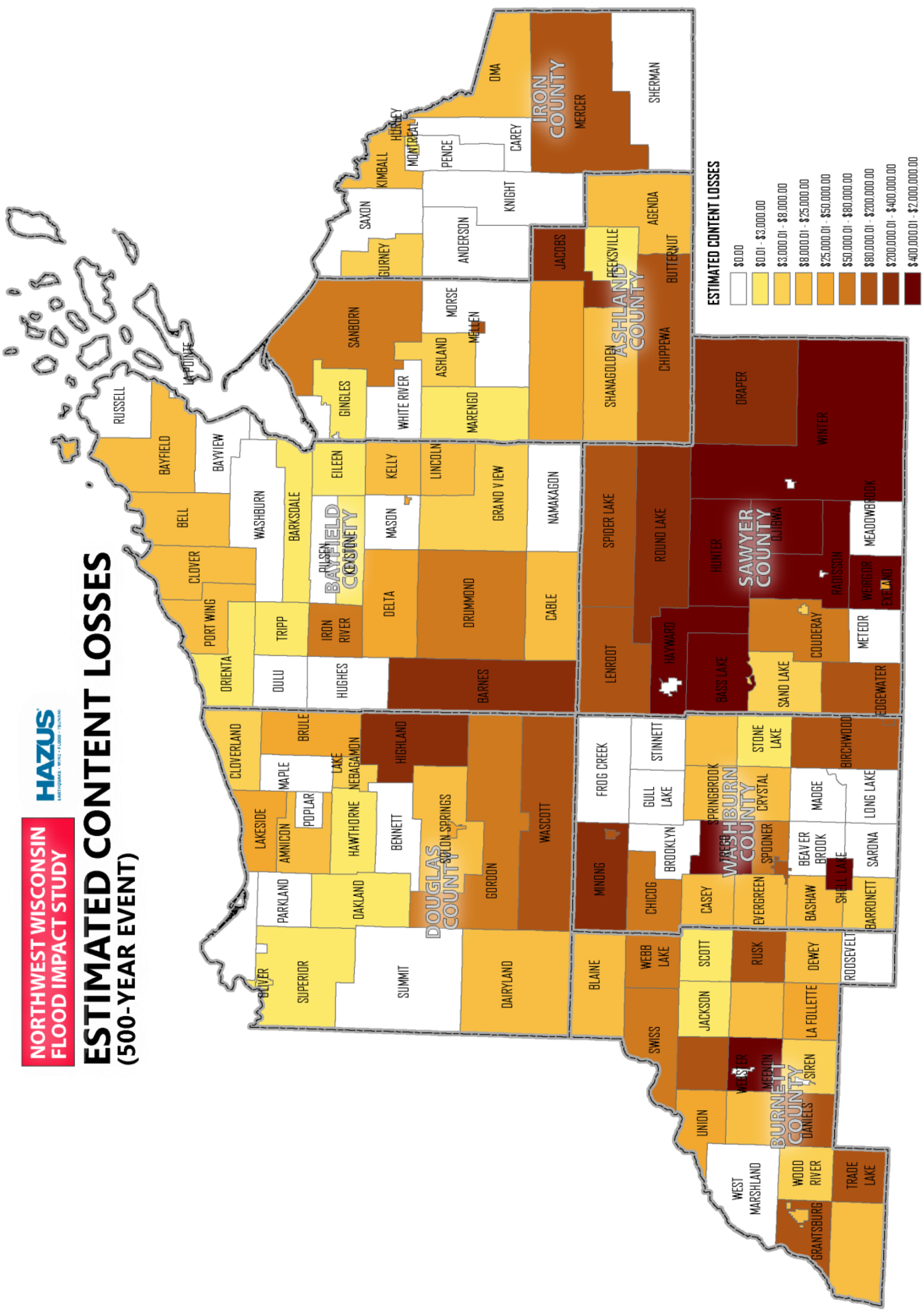
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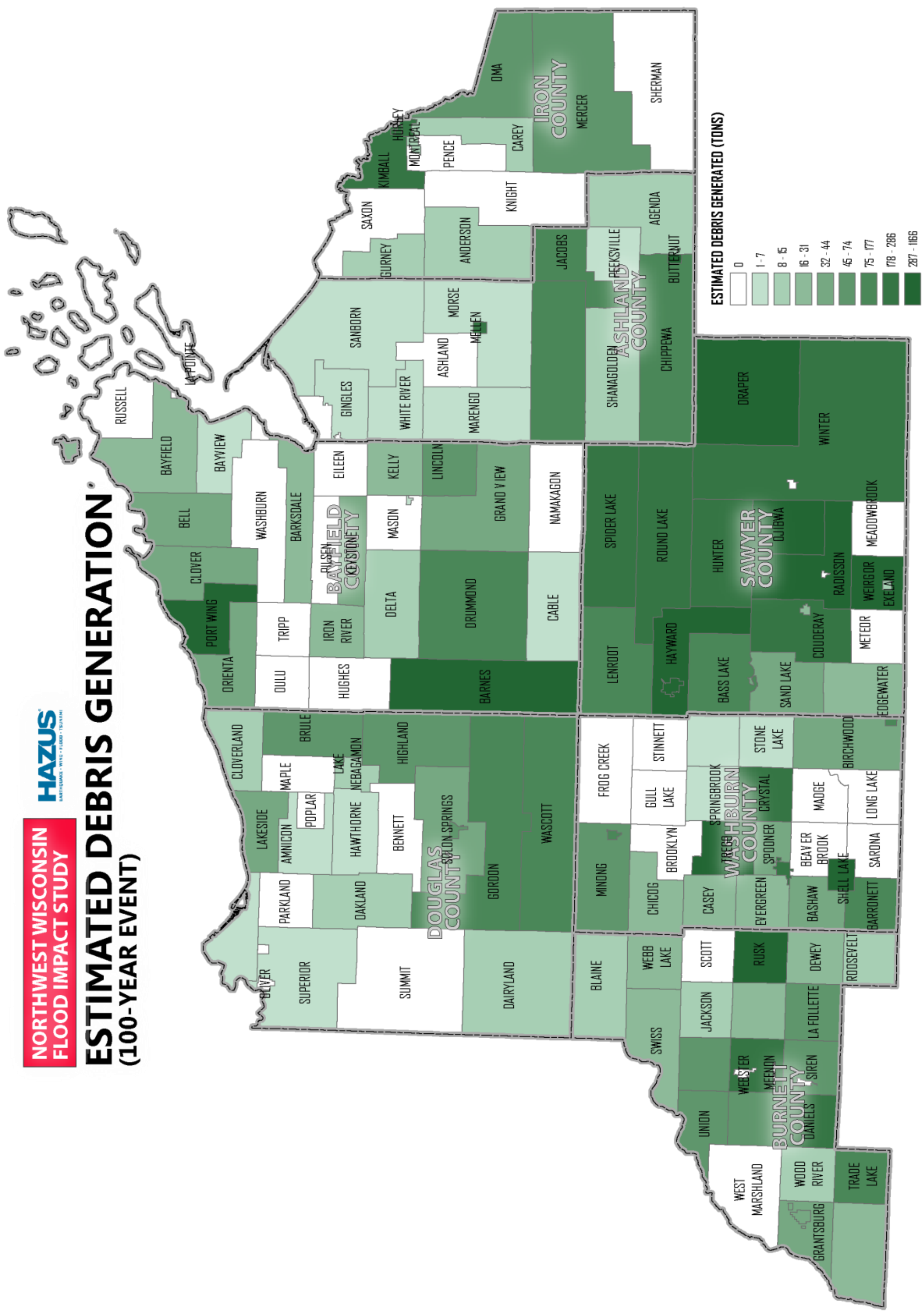
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HAZUS
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ESTIMATED DEBRIS GENERATED (TONS)
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45 - 74
75 - 177
178 - 286
287 - 1166
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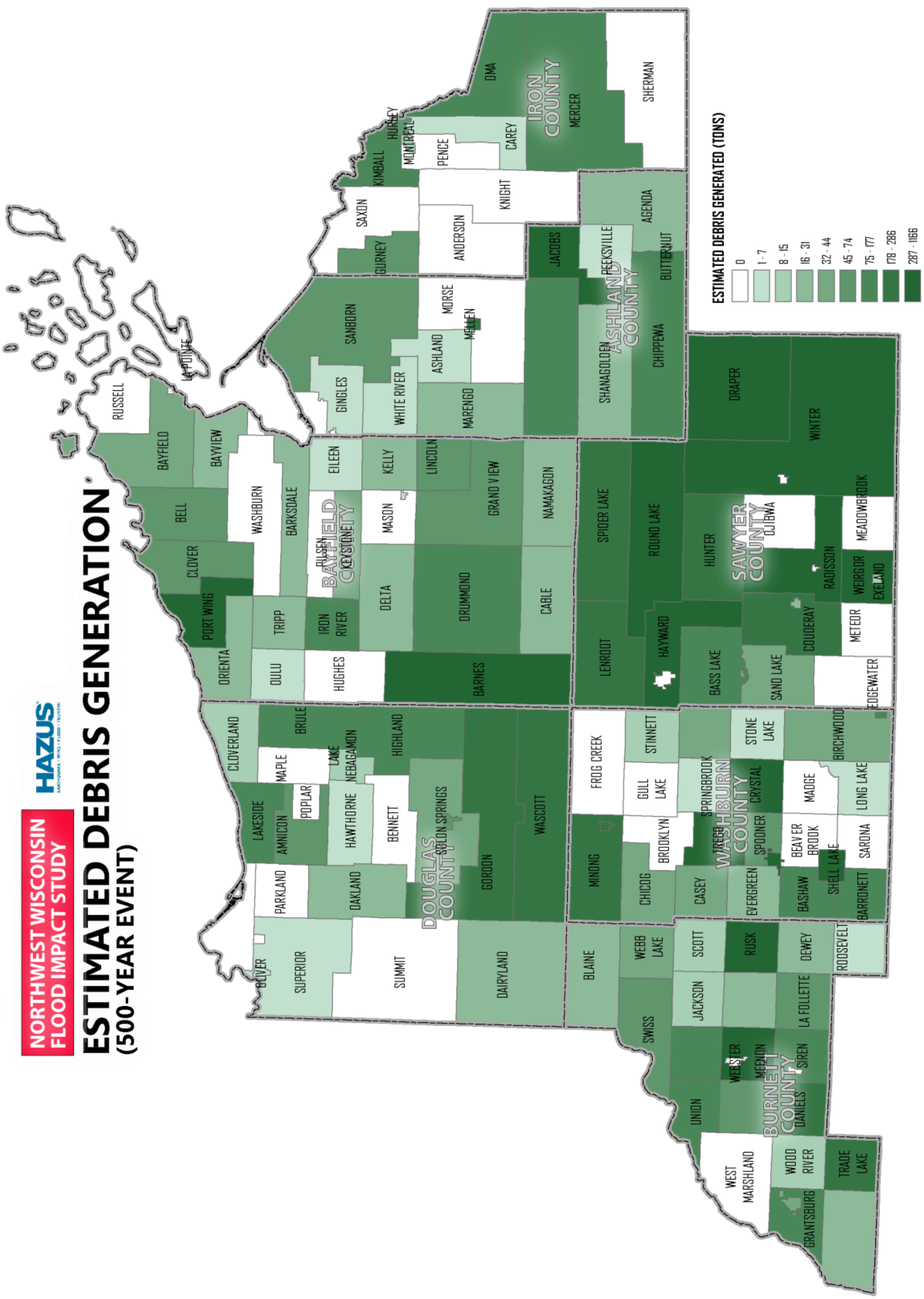
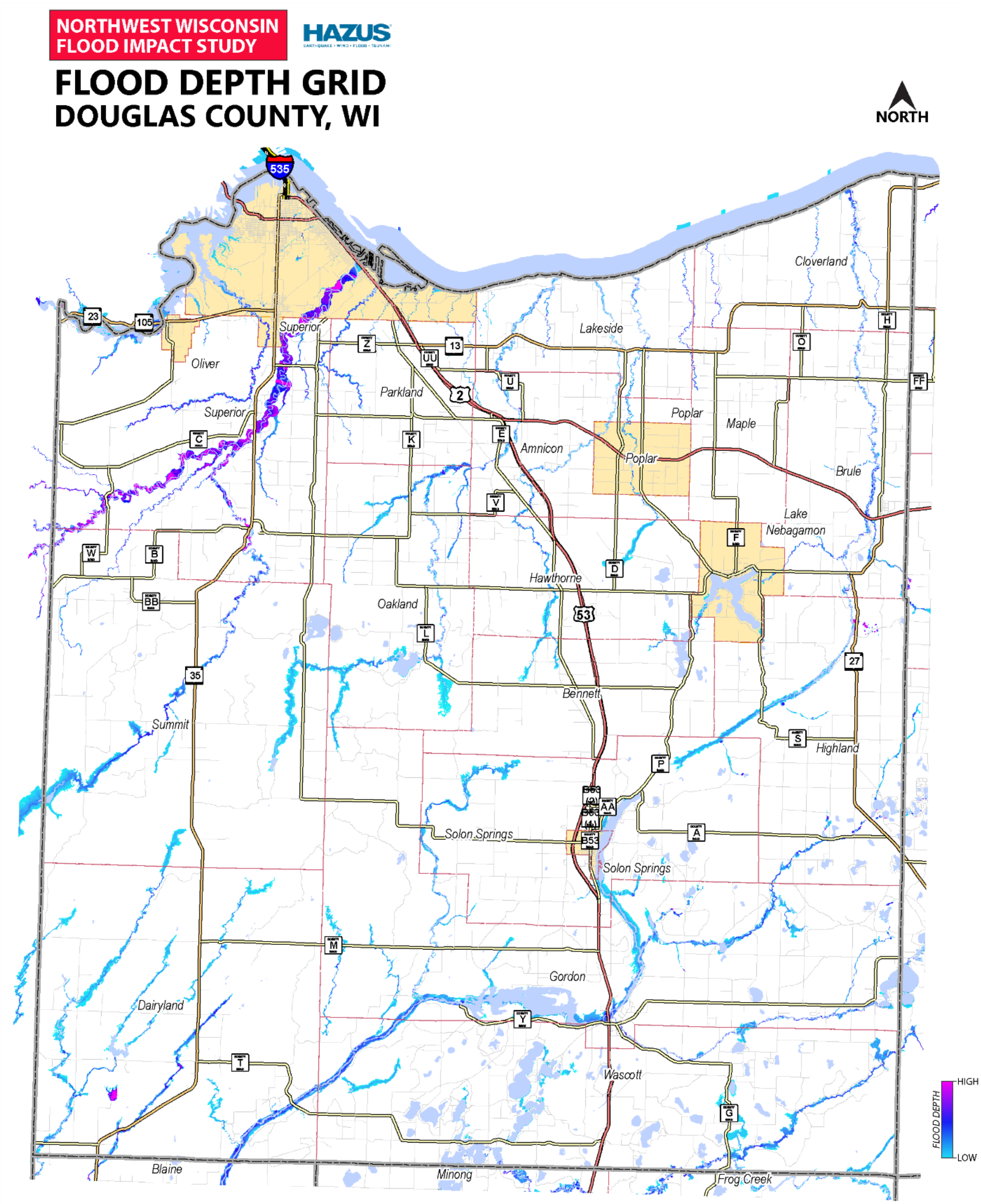
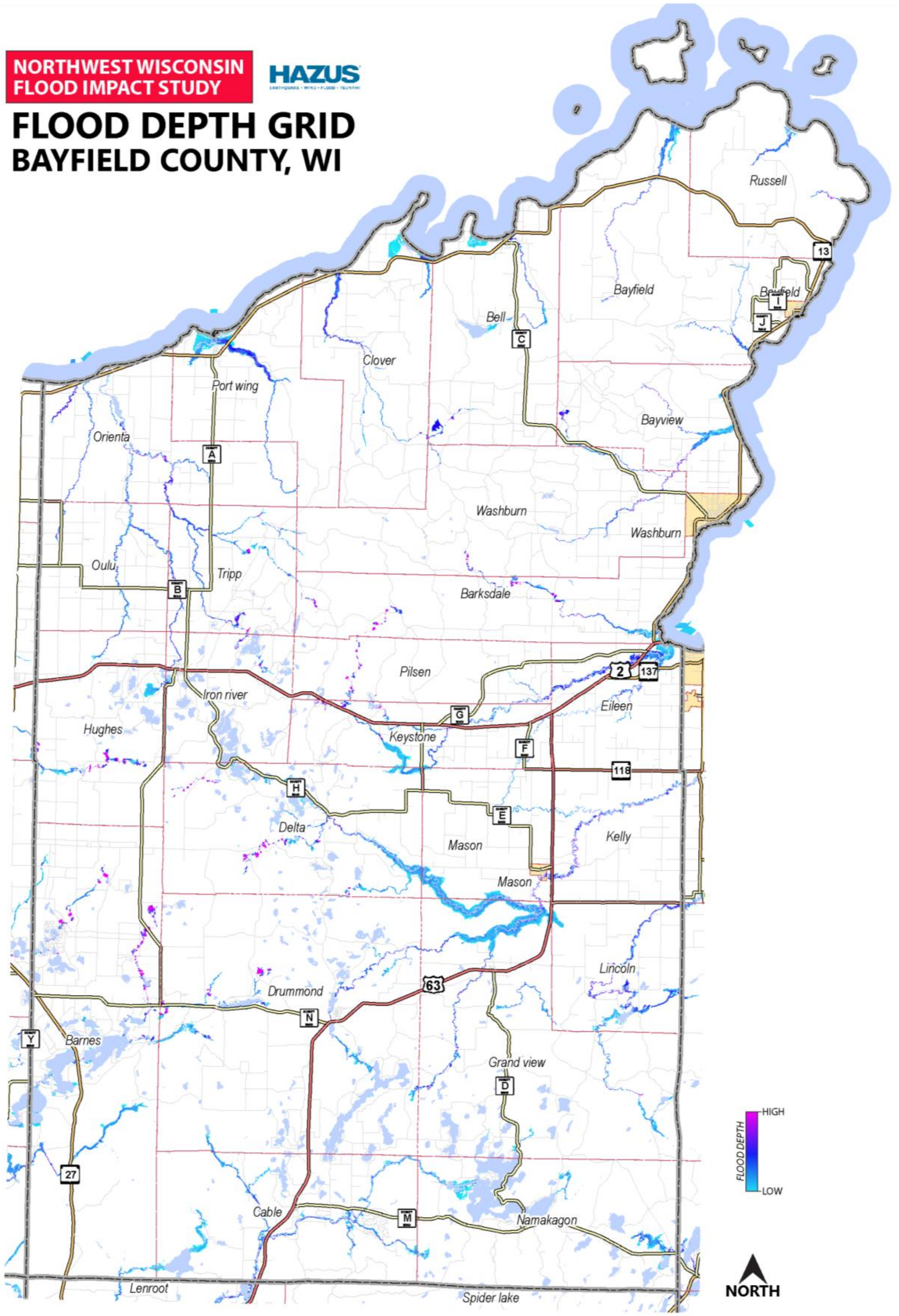
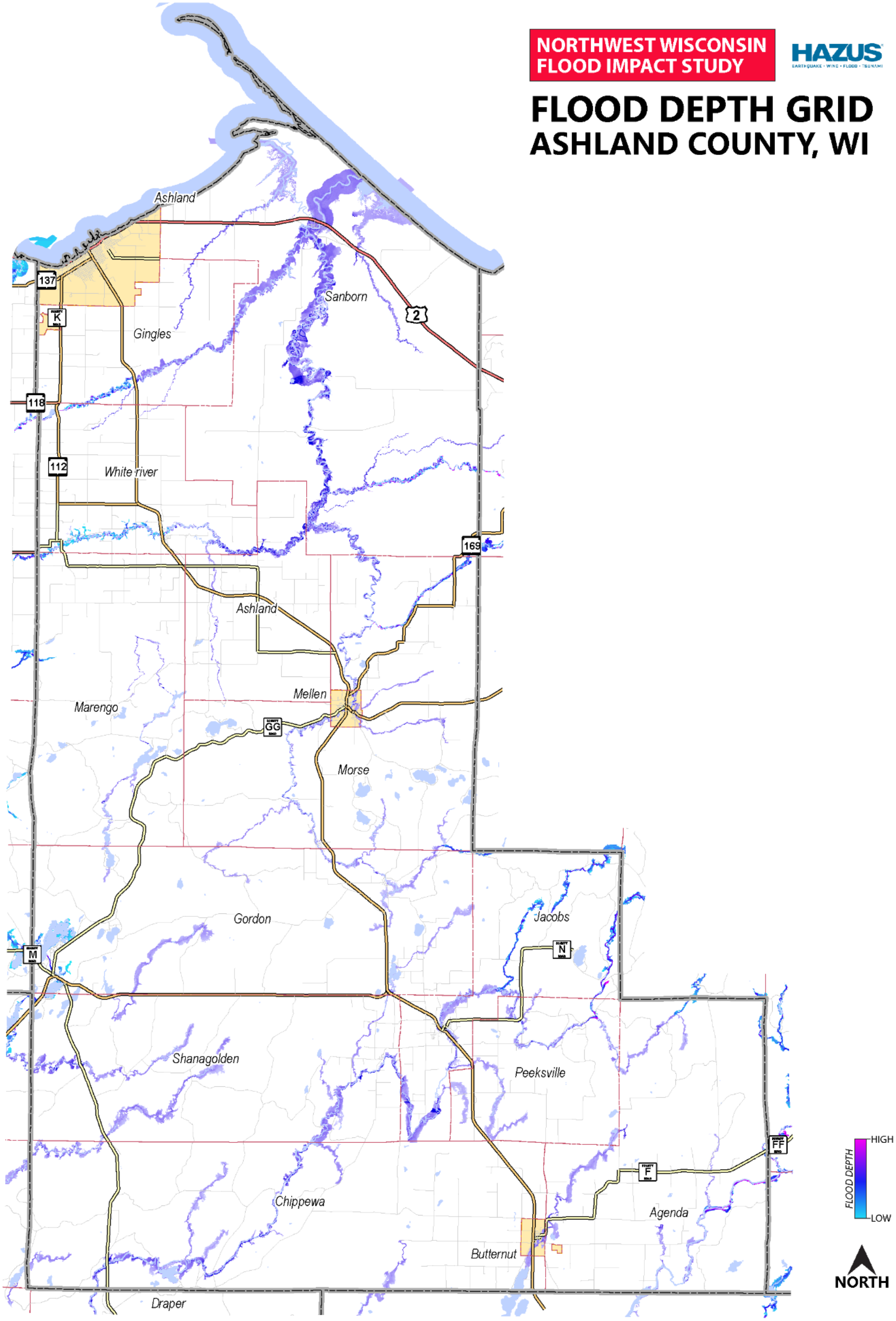
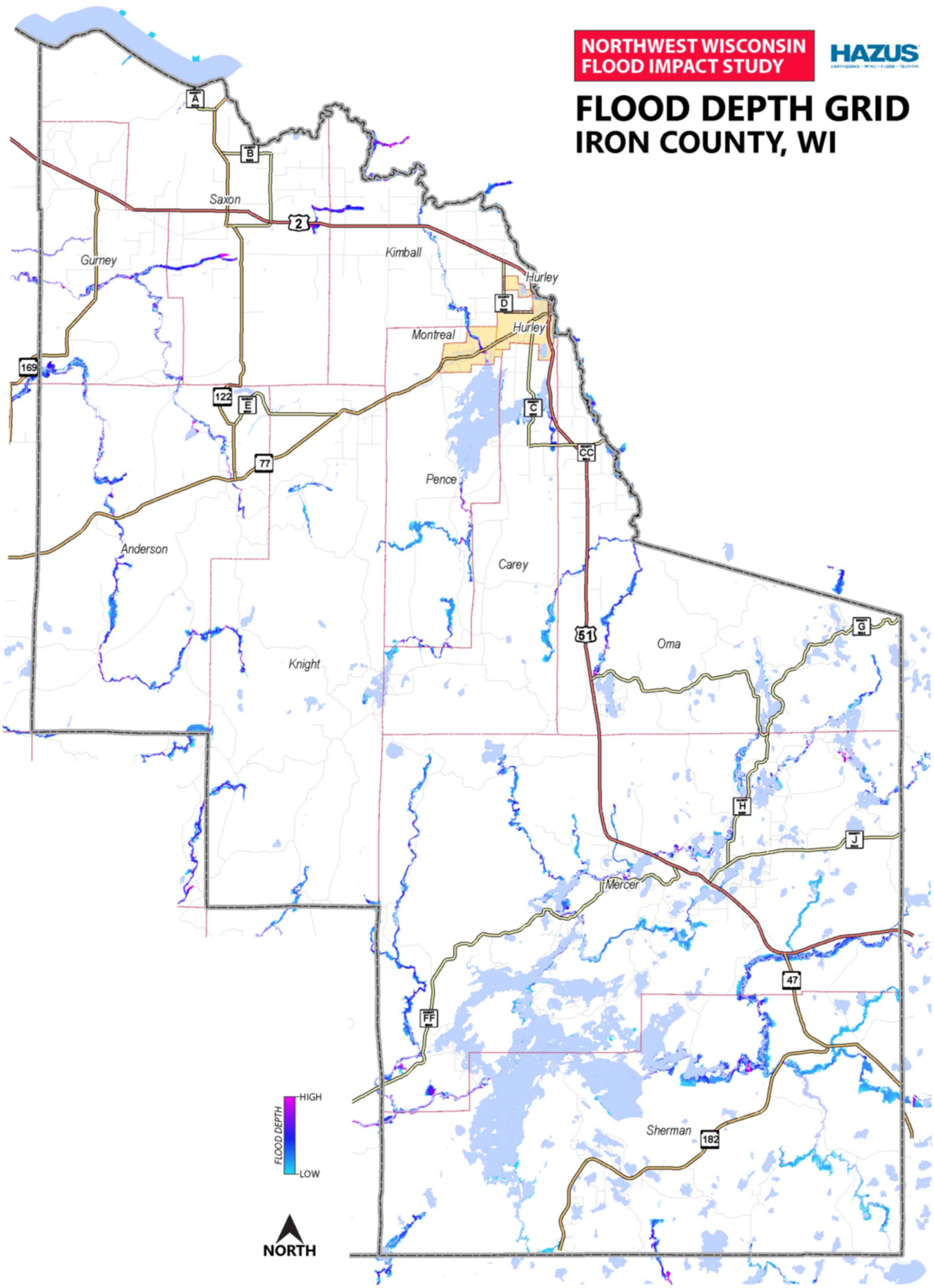
WOOD RIVER
TRADE LAKE
GRANTSBURG
OLIVER

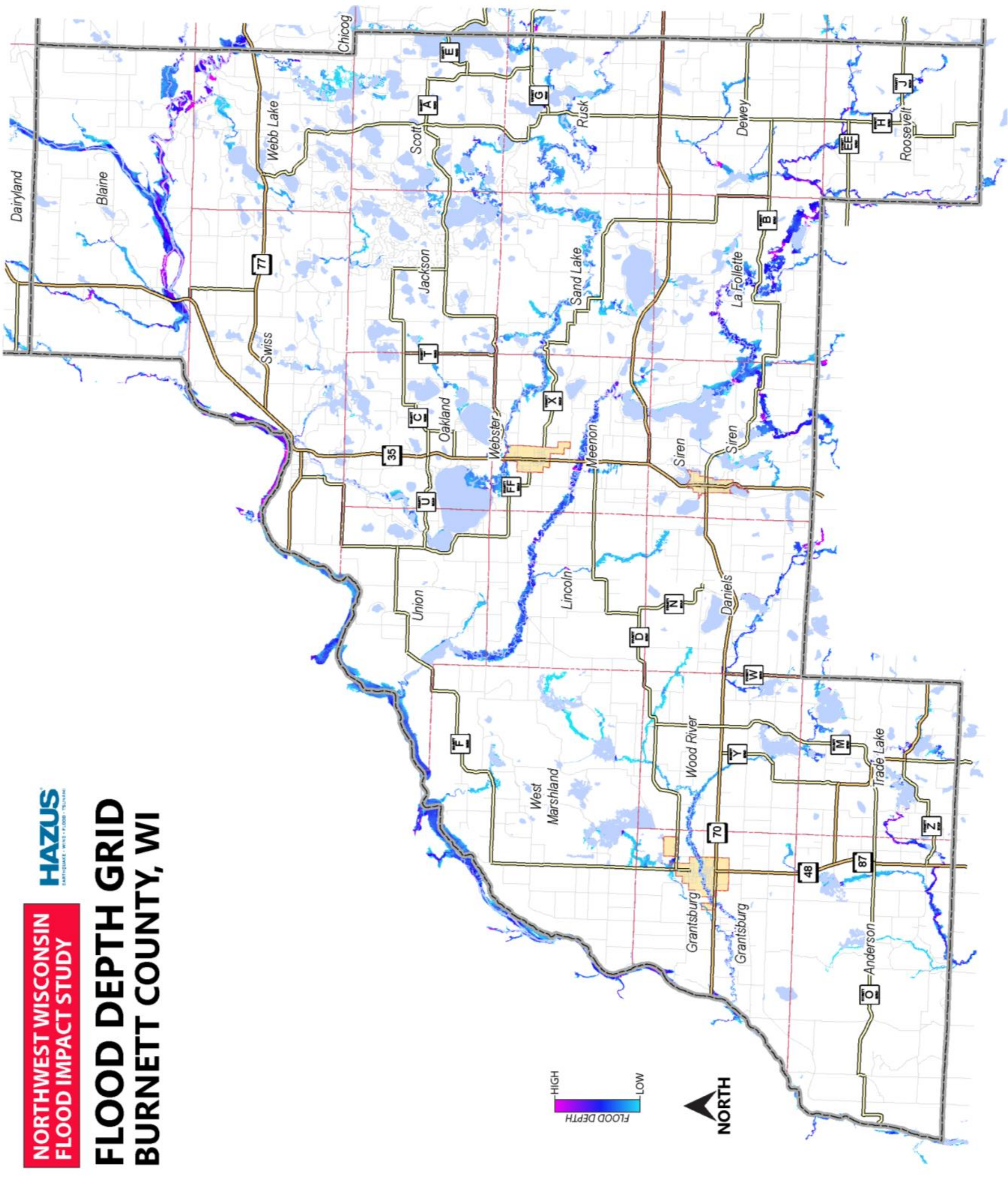

NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
ESTIMATED DEBRIS GENERATION
(500-YEAR EVENT)
DOUGLAS COUNTY
BAYFIELD COUNTY
ASHLAND COUNTY
IRON COUNTY
SAWYER COUNTY
WASHBURN COUNTY
BURNETT COUNTY
ESTIMATED DEBRIS GENERATED (TONS)
0
1 - 7
8 - 15
16 - 31
32 - 44
45 - 74
75 - 177
178 - 286
287 - 1166


NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
DOUGLAS COUNTY, WI
NORTH
Superior
Oliver
Parkland
Lakeside
Cloverland
Amnicon
Poplar
Maple
Brule
Lake Nebagamon
Hawthorne
Oakland
Bennett
Summit
Highland
Solon Springs
Gordon
Dairyland
Wascott
Blaine
Minong
Frog Creek
FLOOD DEPTH
HIGH
LOW


NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
BAYFIELD COUNTY, WI
Russell
Bayfield
Bell
Clover
Port wing
Orienta
Bayview
Washburn
Oulu
Tripp
Barksdale
Pilsen
Iron river
Eileen
Hughes
Keystone
Delta
Mason
Kelly
Lincoln
Drummond
Barnes
Grand view
Cable
Namakagon
Lenroot
Spider lake
FLOOD DEPTH
HIGH
LOW
NORTH


NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
ASHLAND COUNTY, WI
Ashland
Sanborn
Gingles
White river
Ashland
Mellen
Marengo
Morse
Gordon
Jacobs
Shanagolden
Peeksville
Chippewa
Agenda
Butternut
Draper
137
K
118
112
2
169
GG
M
N
F
FF
FLOOD DEPTH
HIGH
LOW
NORTH

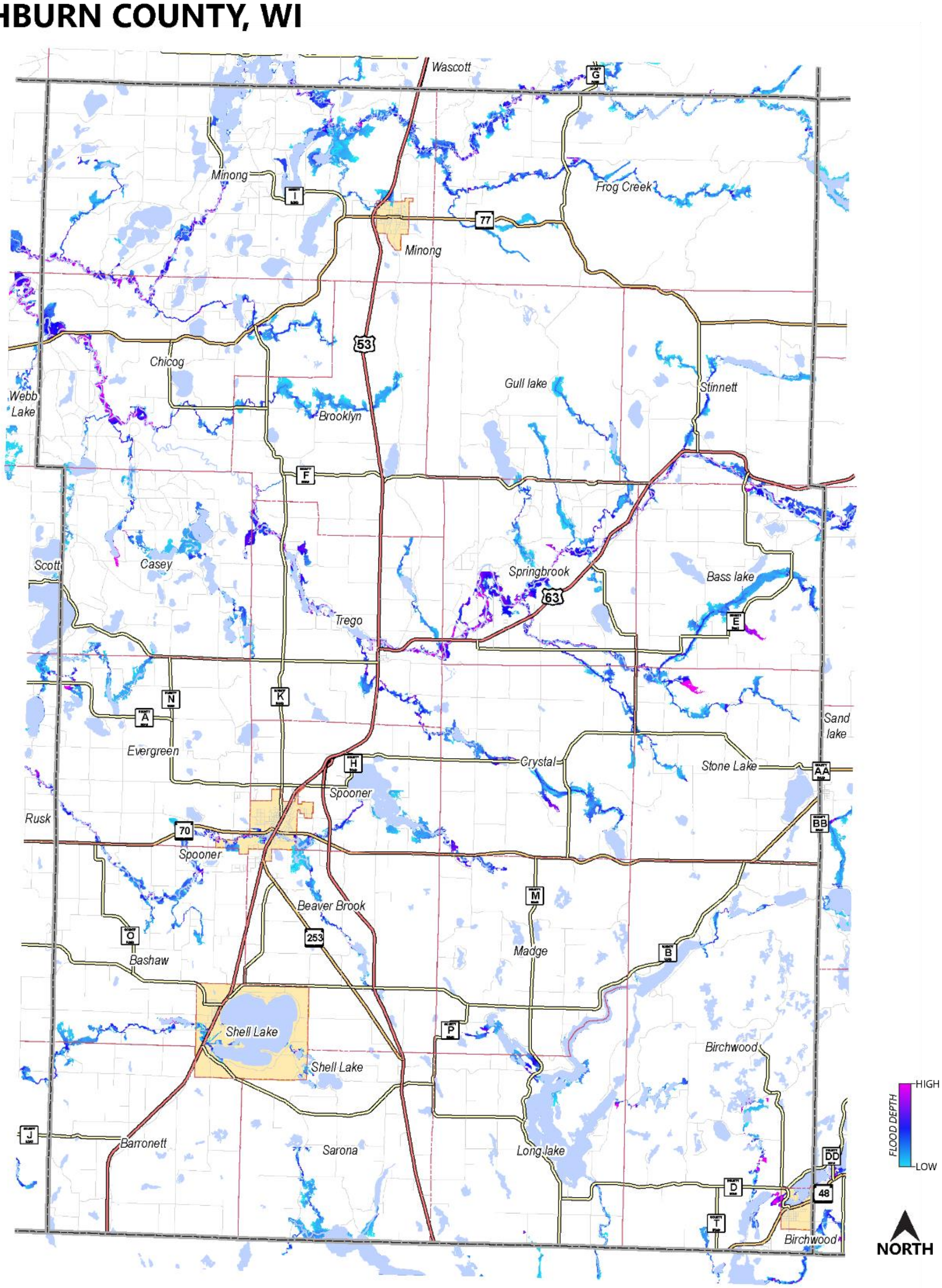

NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
IRON COUNTY, WI
Saxon
Gurney
Kimball
Hurley
Montreal
Pence
Anderson
Carey
Knight
Oma
Mercer
Sherman
HIGH
FLOOD DEPTH
LOW
NORTH

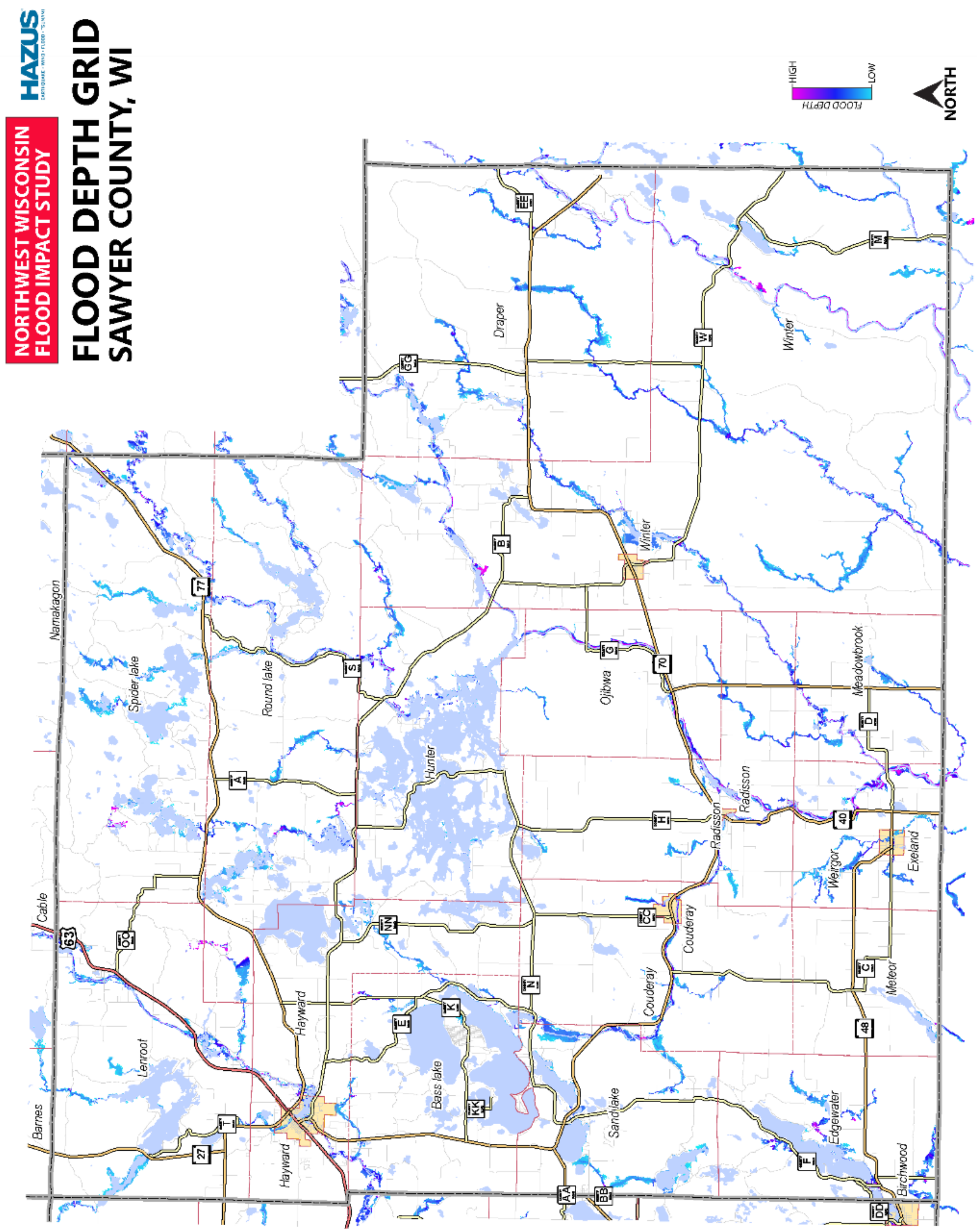

NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
BURNETT COUNTY, WI
FLOOD DEPTH
HIGH
LOW
NORTH
Dairyland
Blaine
Webb Lake
Chicog
Scott
Rusk
Dewey
Roosevelt
Jackson
Sand Lake
La Follette
Swiss
Oakland
Webster
Meenon
Siren
Union
Lincoln
Daniels
West Marshland
Wood River
Trade Lake
Grantsburg
Anderson
77
35
70
48
87

NORTHWEST WISCONSIN FLOOD IMPACT STUDY

HAZUS

FLOOD DEPTH GRID
WASHBURN COUNTY, WI




NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
FLOOD DEPTH GRID
SAWYER COUNTY, WI
FLOOD DEPTH
HIGH
LOW
NORTH
Namakagon
Spider lake
Round lake
Hunter
Draper
Winter
Ojibwa
Meadowbrook
Radisson
Weirgor
Exeland
Couderay
Meteor
Edgewater
Birchwood
Sand lake
Bass lake
Hayward
Lenroot
Cable
Barnes

BUILDING AND LOSS ESTIMATES

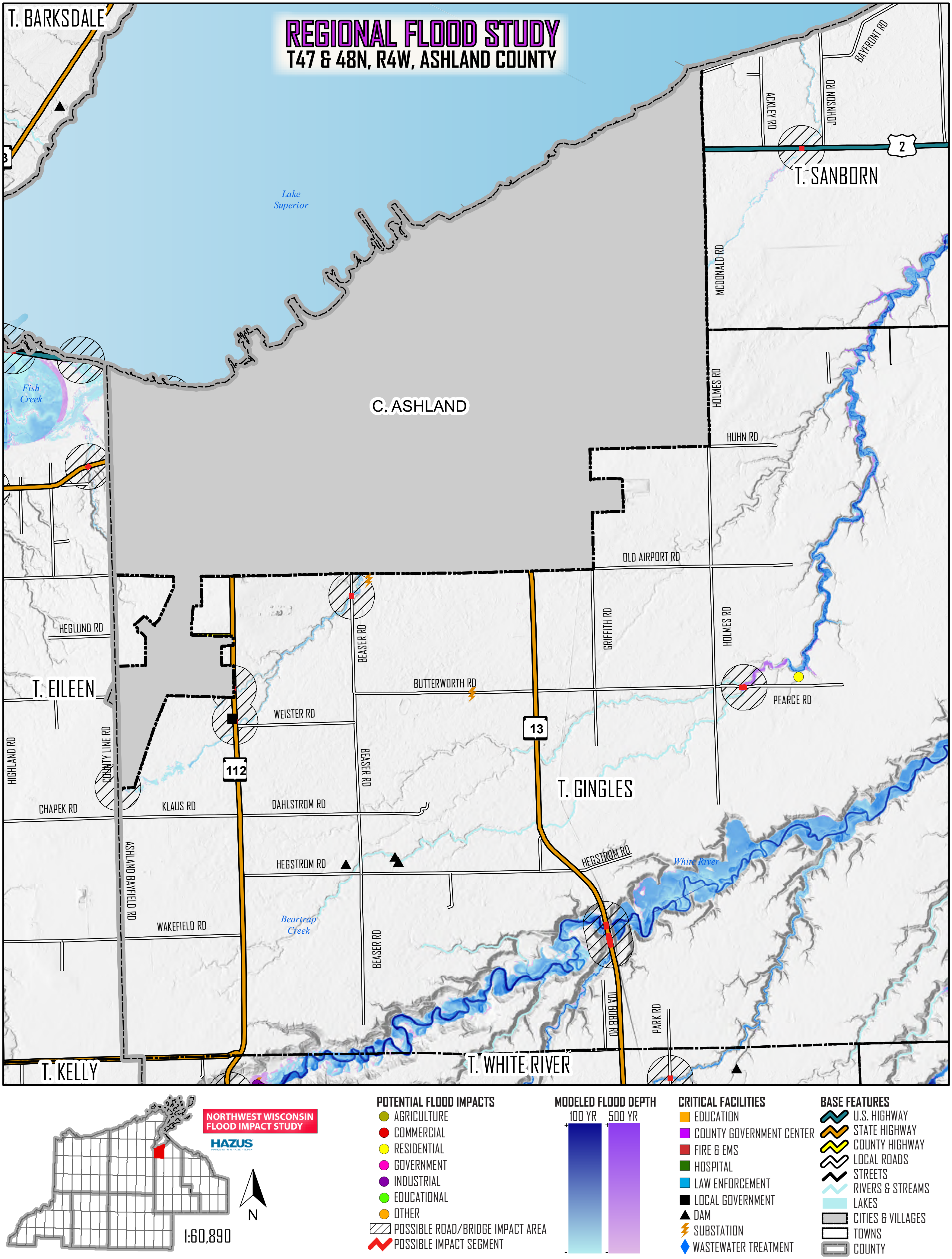
ASHLAND COUNTY

HAZUS 100-YEAR FLOOD LOSS ESTIMATES - ASHLAND COUNTY

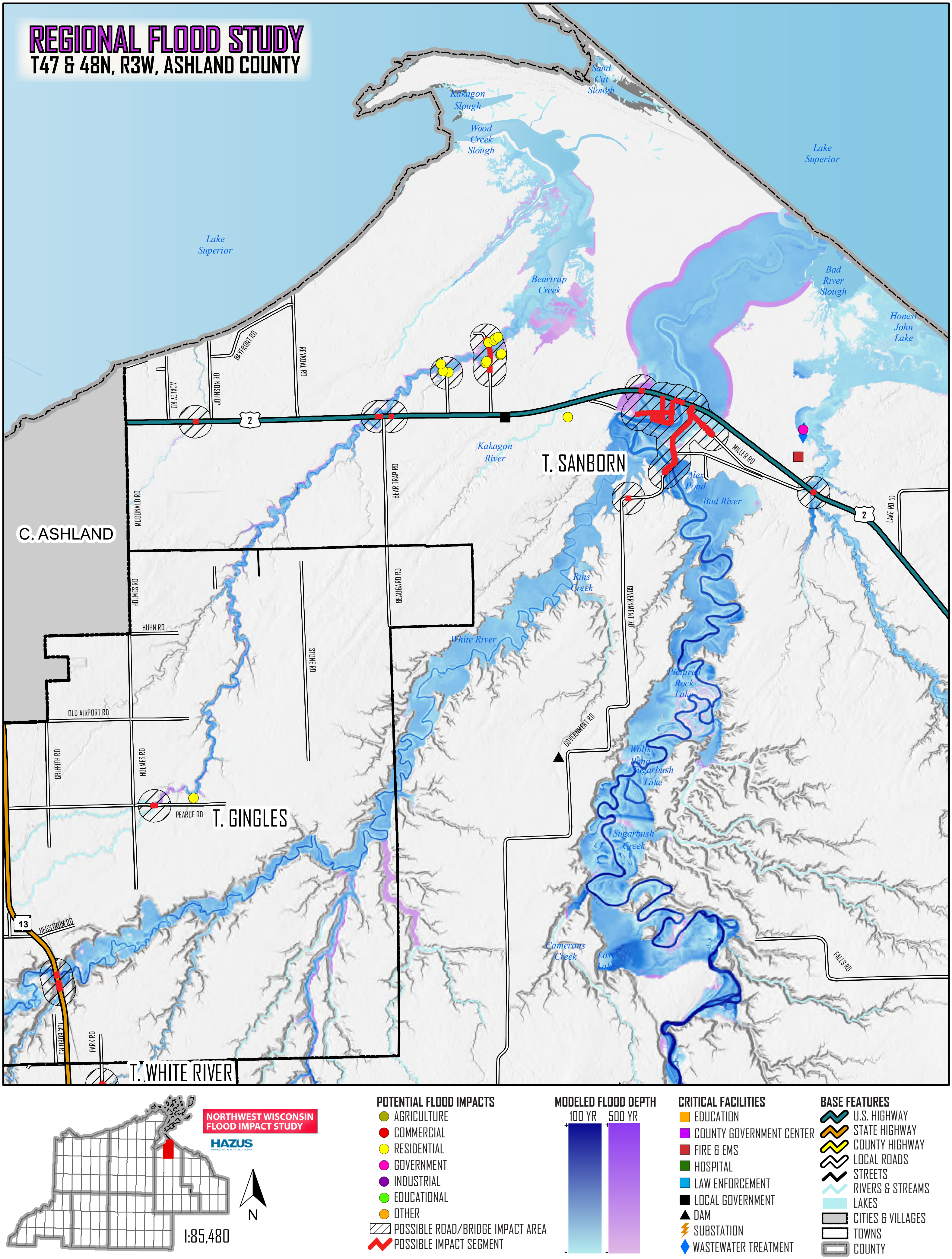
Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF MELLEN	17	$ 74,495.00	$ 77,857.00	$ 7,326.00	234
T. OF AGENDA	2	$ 33,789.00	$ 11,816.00	$ -	13
T. OF ASHLAND	1	$ -	$ -	$ -	0
T. OF CHIPPEWA	21	$ 207,621.00	$ 72,087.00	$ -	144
T. OF GINGLES	1	$ 7,859.00	$ 2,607.00	$ -	1
T. OF GORDON	8	$ 70,128.00	$ 20,295.00	$ -	117
T. OF JACOBS	10	$ 31,921.00	$ 46,933.00	$ 10,413.00	135
T. OF MARENGO	1	$ -	$ -	$ -	5
T. OF MORSE	1	$ 34,296.00	$ 19,188.00	$ -	7
T. OF PEEKSVILLE	2	$ 3,415.00	$ 1,204.00	$ -	7
T. OF SANBORN	2	$ 4,978.00	$ 1,871.00	$ -	7
T. OF SHANAGOLDEN	3	$ 4,827.00	$ 1,829.00	$ -	15
T. OF WHITE RIVER	1	$ -	$ -	$ -	1
V. OF BUTTERNUT	22	$ 108,833.00	$ 200,411.00	$ 30,101.00	316
GRAND TOTAL	**92**	**$ 582,162.00**	**$ 456,098.00**	**$ 47,840.00**	**1002**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - ASHLAND COUNTY

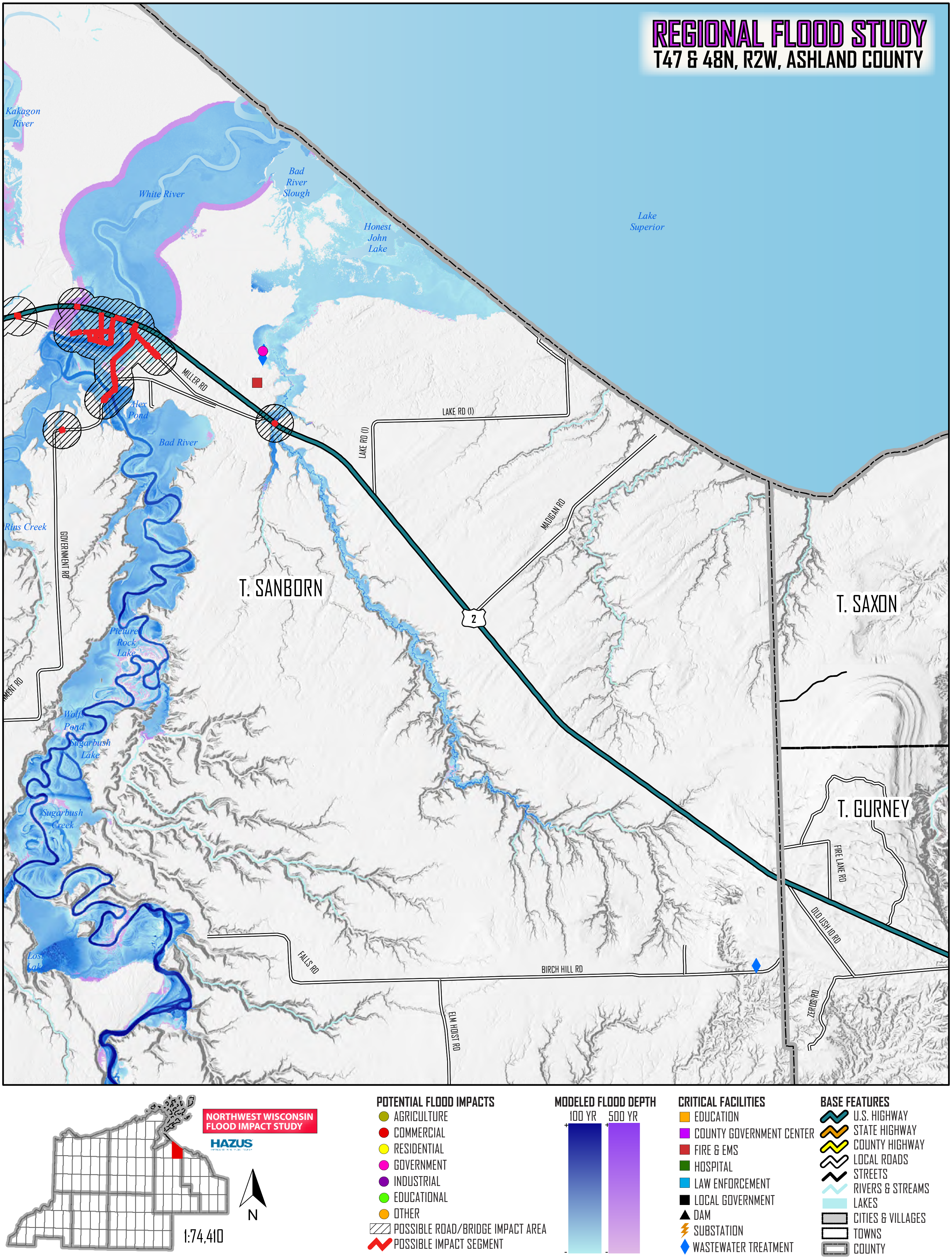
Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF MELLEN	12	$ 86,218.00	$ 112,561.00	$ 12,514.00	237
T. OF AGENDA	2	$ 50,609.00	$ 17,150.00	$ -	21
T. OF ASHLAND	2	$ 7,995.00	$ 3,140.00	$ -	3
T. OF CHIPPEWA	24	$ 263,865.00	$ 85,691.00	$ -	171
T. OF GINGLES	1	$ 8,967.00	$ 2,844.00	$ -	1
T. OF GORDON	8	$ 89,271.00	$ 25,171.00	$ -	115
T. OF JACOBS	16	$ 86,810.00	$ 264,883.00	$ 36,561.00	428
T. OF MARENGO	3	$ 7,590.00	$ 1,796.00	$ -	22
T. OF PEEKSVILLE	2	$ 7,226.00	$ 2,551.00	$ -	7
T. OF SANBORN	12	$ 127,432.00	$ 70,234.00	$ -	55
T. OF SHANAGOLDEN	4	$ 41,208.00	$ 14,072.00	$ -	20
T. OF WHITE RIVER	2	$ -	$ -	$ 17,201.00	3
V. OF BUTTERNUT	26	$ 97,900.00	$ 138,444.00	$ 58,323.00	325
GRAND TOTAL	**114**	**$ 875,091.00**	**$ 738,537.00**	**$ 124,599.00**	**1,408**



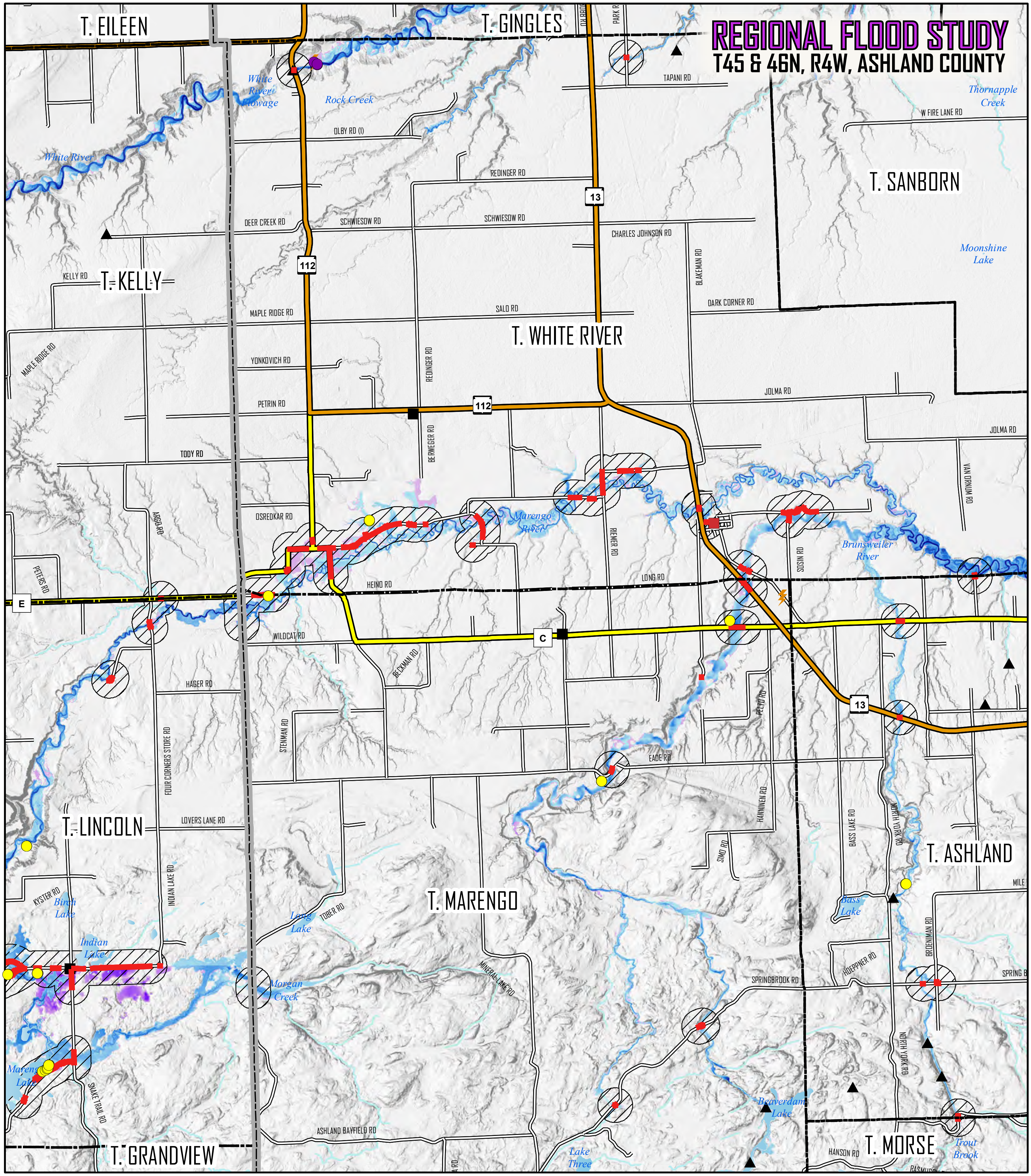
REGIONAL FLOOD STUDY
T47 & 48N, R4W, ASHLAND COUNTY
T. BARKSDALE
Lake Superior
C. ASHLAND
T. SANBORN
ACKLEY RD
JOHNSON RD
BAYFRONT RD
2
MCDONALD RD
HOLMES RD
HUHN RD
Fish Creek
OLD AIRPORT RD
GRIFFITH RD
HEGLUND RD
BEASER RD
BUTTERWORTH RD
PEARCE RD
T. EILEEN
WEISTER RD
13
112
HIGHLAND RD
COUNTY LINE RD
T. GINGLES
CHAPEK RD
KLAUS RD
DAHLSTROM RD
ASHLAND BAYFIELD RD
HEGSTROM RD
White River
Beartrap Creek
WAKEFIELD RD
IDA ROBB RD
PARK RD
T. KELLY
T. WHITE RIVER
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:60,890
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

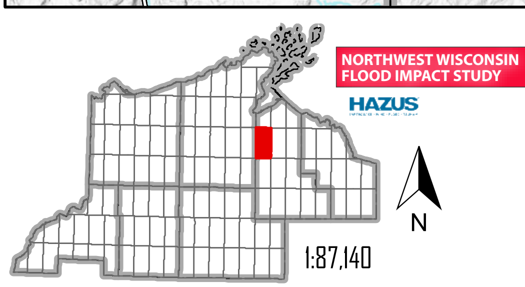


REGIONAL FLOOD STUDY
T47 & 48N, R3W, ASHLAND COUNTY
Lake Superior
Sand Cut Slough
Kakagon Slough
Wood Creek Slough
Beartrap Creek
Bad River Slough
Honest John Lake
Kakagon River
T. SANBORN
Alex Pond
Bad River
MILLER RD
LAKE RD (I)
BAYFRONT RD
REYKDAL RD
ACKLEY RD
JOHNSON RD
MCDONALD RD
BEAR TRAP RD
BEAUGARD RD
C. ASHLAND
Rins Creek
GOVERNMENT RD
White River
HOLMES RD
HUHN RD
STONE RD
Pictured Rock Lake
OLD AIRPORT RD
GRIFFITH RD
Wolfs Pond
Sugarbush Lake
PEARCE RD
T. GINGLES
Sugarbush Creek
Camerons Creek
FALLS RD
HEGSTROM RD
PARK RD
T. WHITE RIVER
2
13
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,480
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T47 & 48N, R2W, ASHLAND COUNTY
Kakagon River
White River
Bad River Slough
Honest John Lake
Lake Superior
MILLER RD
Alex Pond
Bad River
LAKE RD (I)
LAKE RD (I)
MADIGAN RD
Rins Creek
GOVERNMENT RD
T. SANBORN
2
T. SAXON
Picture Rock Lake
Wolf Pond
Sugarbush Lake
Sugarbush Creek
T. GURNEY
FIRE LANE RD
OLD USH 10 RD
Lost Lake
FALLS RD
BIRCH HILL RD
ELM HOIST RD
ZEROS RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:74,410
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

REGIONAL FLOOD STUDY
T45 & 46N, R4W, ASHLAND COUNTY





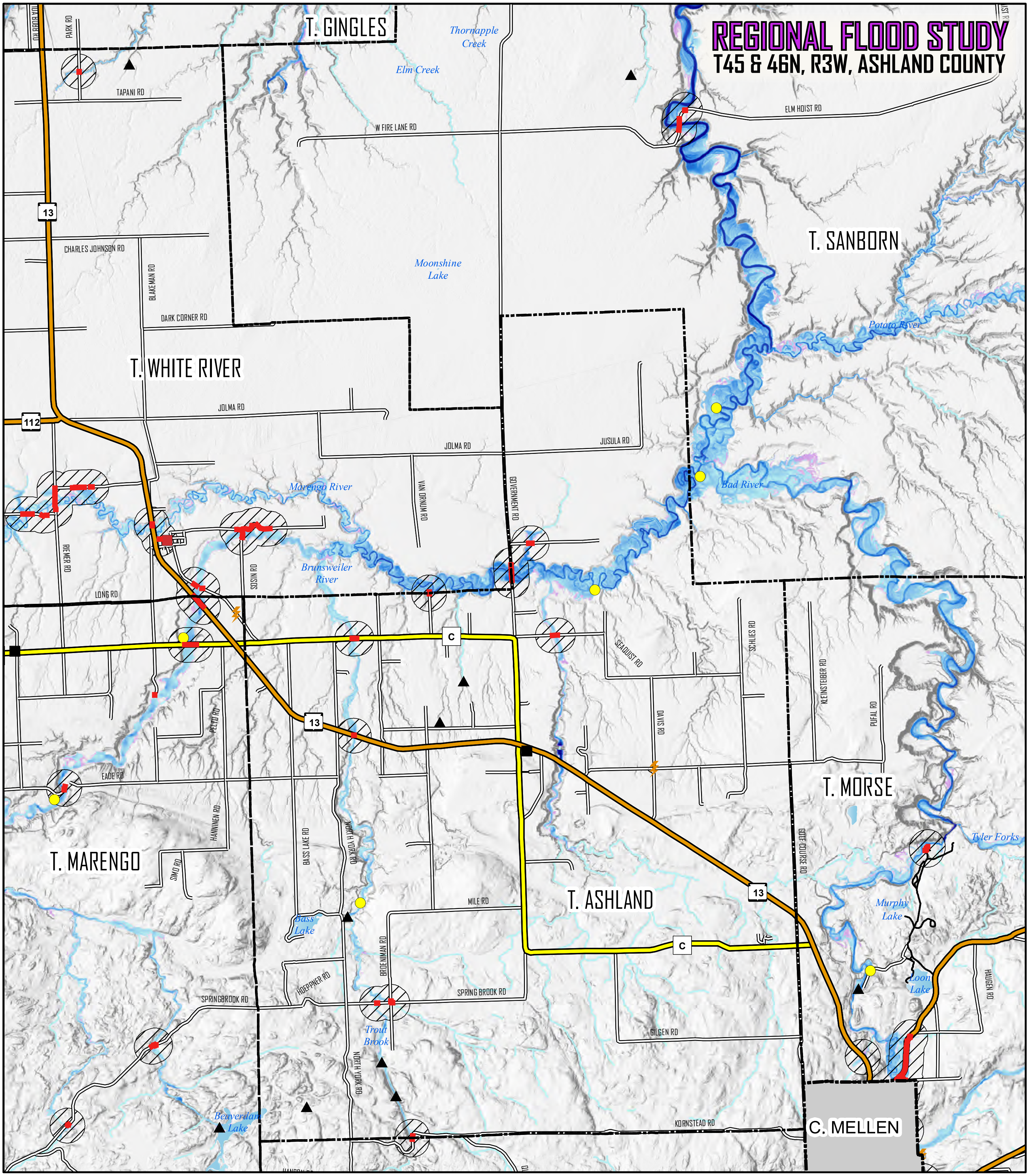
1:87,140

POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH
100 YR | 500 YR
+
-

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



POTENTIAL FLOOD IMPACTS

- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH

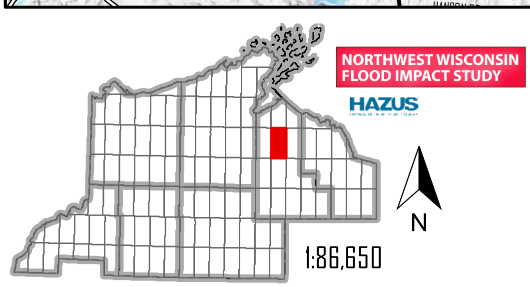
100 YR | 500 YR

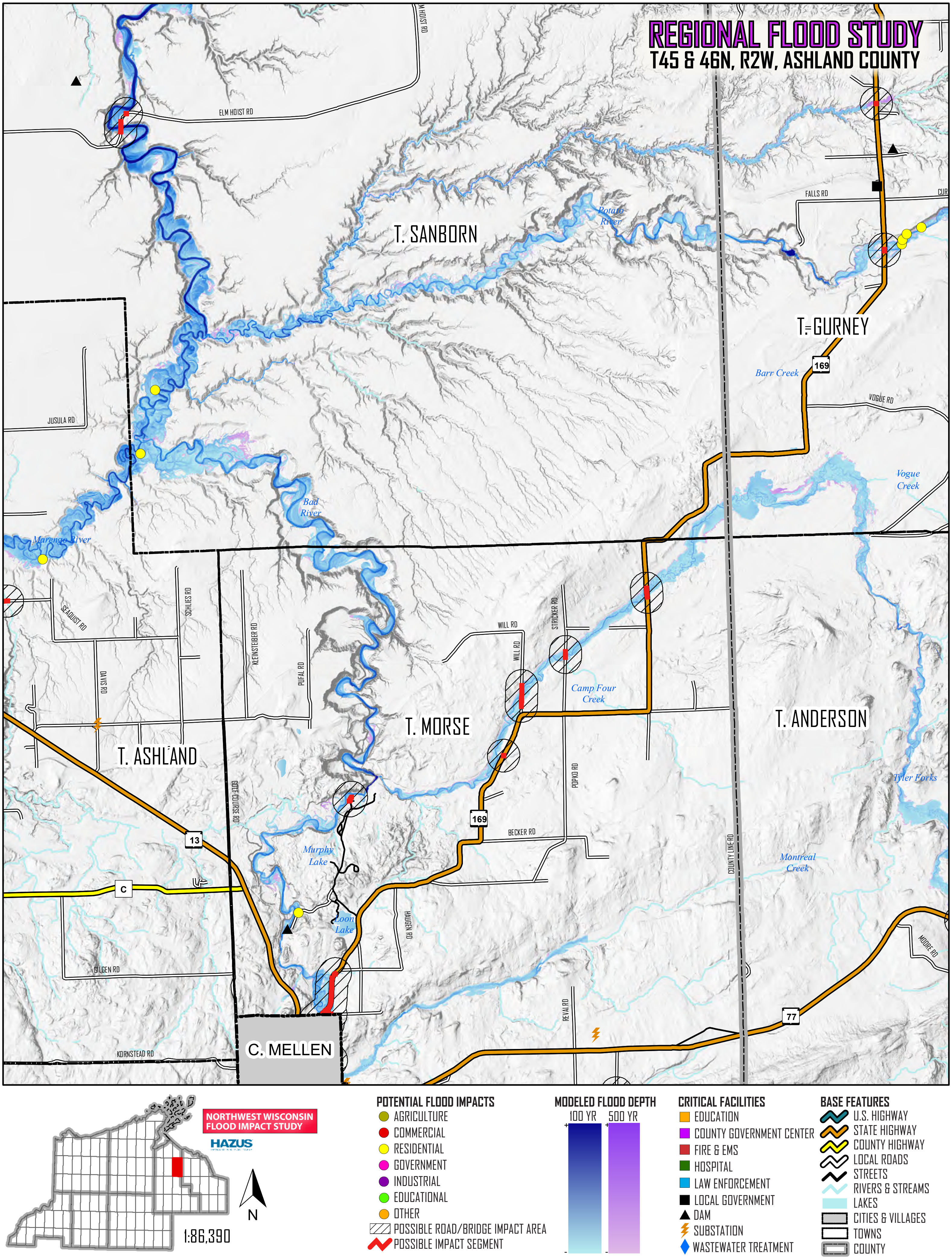
CRITICAL FACILITIES

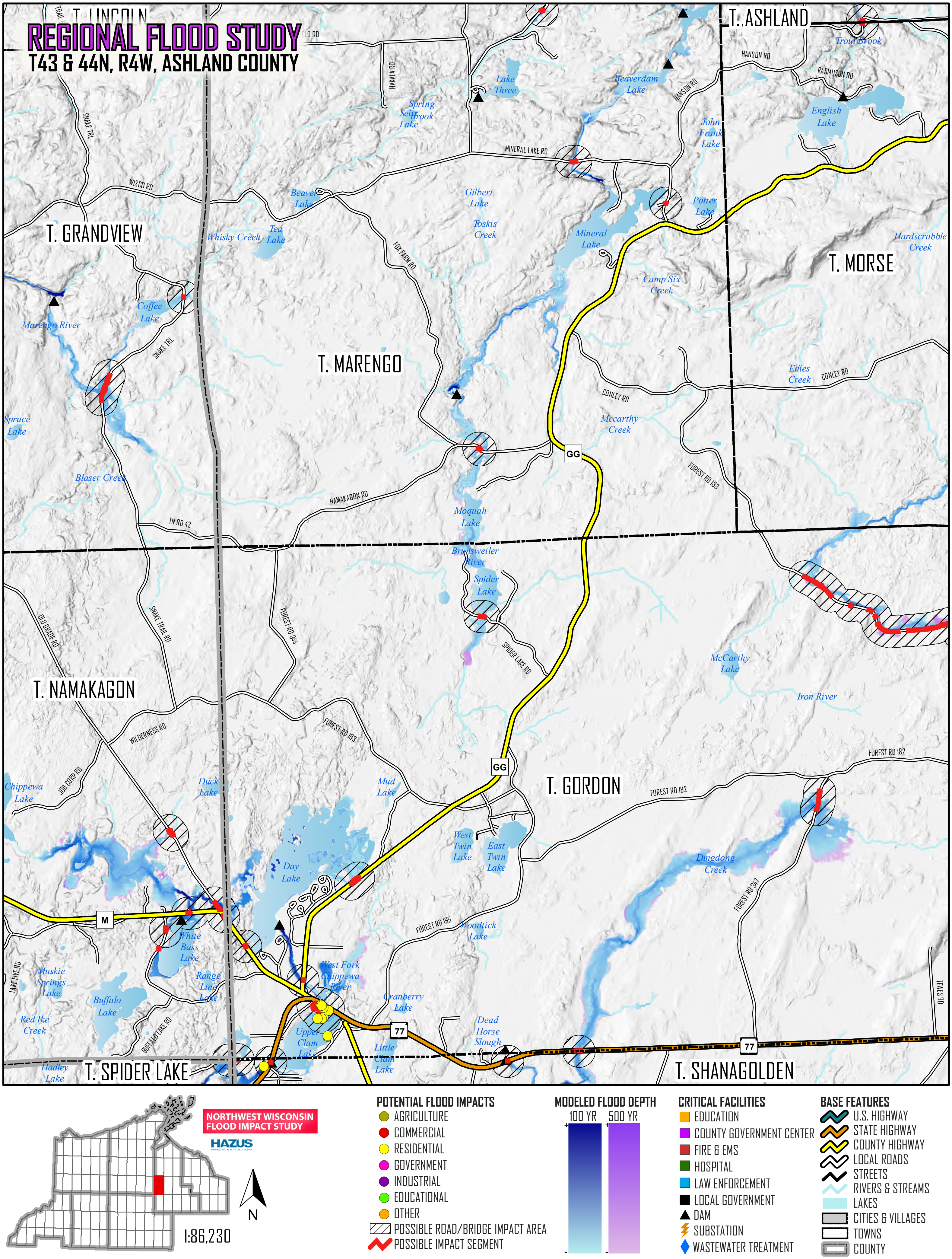
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

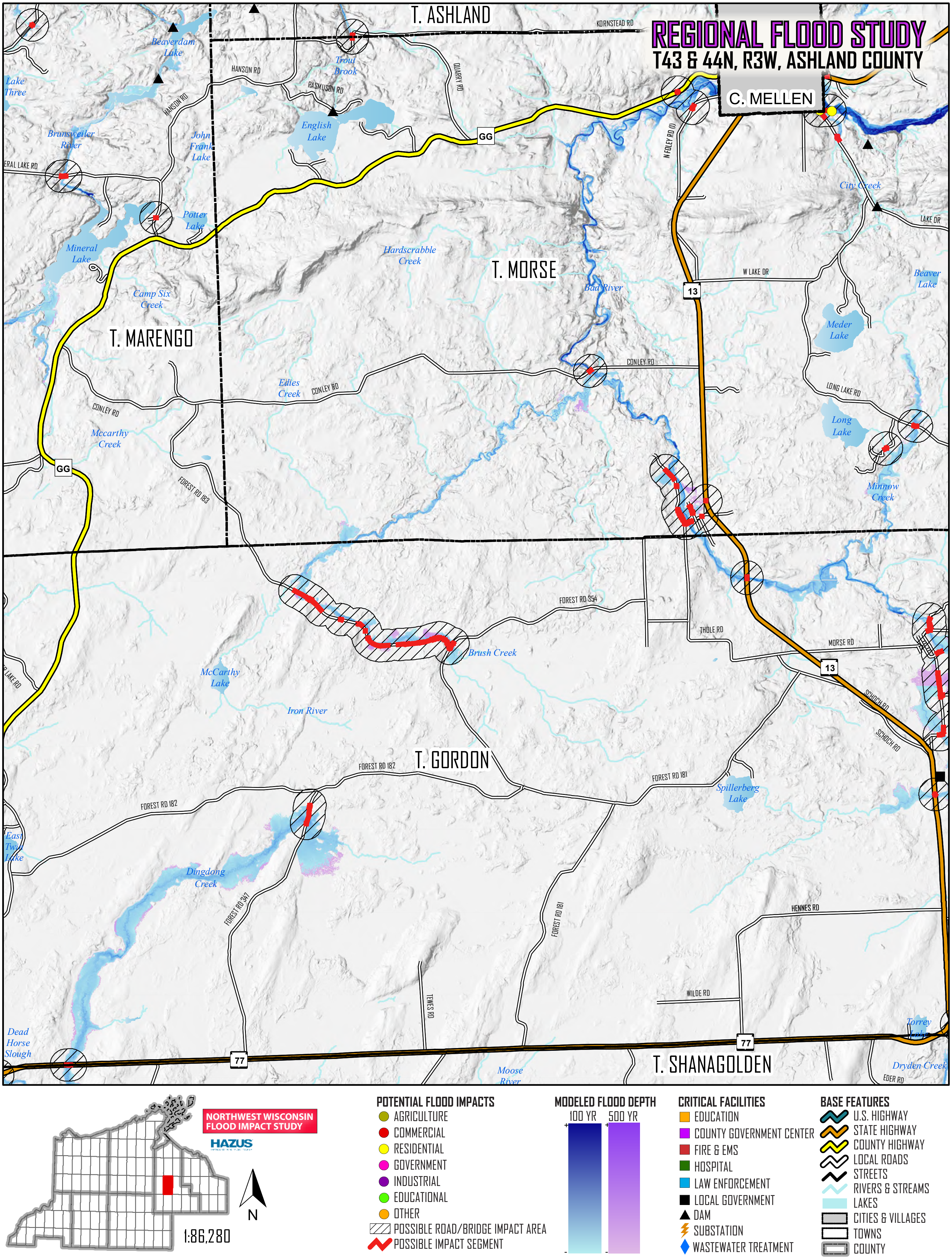
BASE FEATURES

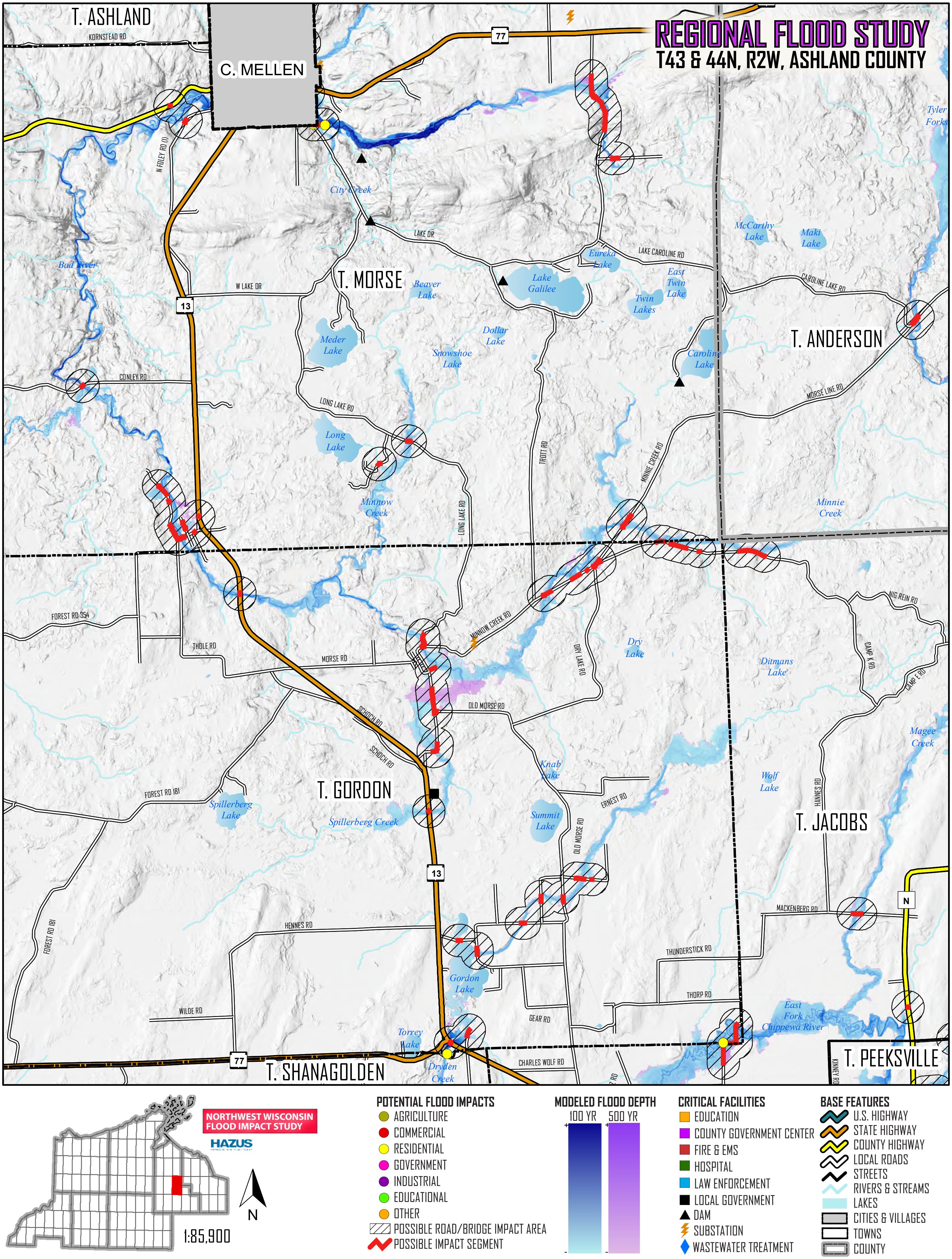
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY




REGIONAL FLOOD STUDY
T45 & 46N, R2W, ASHLAND COUNTY
ELM HOIST RD
T. SANBORN
Potato River
FALLS RD
T. GURNEY
Barr Creek
169
VOGUE RD
JUSULA RD
Bad River
Vogue Creek
Marengo River
SEAQUIST RD
SCHLIES RD
KEINSTEIBER RD
PUFAL RD
WILL RD
STRICKER RD
Camp Four Creek
DAVIS RD
T. ASHLAND
T. MORSE
T. ANDERSON
GOLF COURSE RD
POPKO RD
Tyler Forks
169
BECKER RD
13
Murphy Lake
C
COUNTY LINE RD
Montreal Creek
Loon Lake
HAUGEN RD
GILGEN RD
MOORE RD
77
REVAI RD
KORNSTEAD RD
C. MELLEN
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,390
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T43 & 44N, R4W, ASHLAND COUNTY
T. LINCOLN
T. ASHLAND
T. GRANDVIEW
T. MARENGO
T. MORSE
T. NAMAKAGON
T. GORDON
T. SPIDER LAKE
T. SHANAGOLDEN
Trout Brook
HANSON RD
RASMUSON RD
English Lake
Beaverdam Lake
HANSON RD
John Frank Lake
HAKALA RD
Lake Three
Spring Brook
Seitz Lake
MINERAL LAKE RD
SNAKE TRL
WISCO RD
Beaver Lake
Gilbert Lake
Potter Lake
Toskis Creek
Mineral Lake
Tea Lake
Whisky Creek
FOX FARM RD
Hardscrabble Creek
Camp Six Creek
Coffee Lake
Marengo River
SNAKE TRL
Edies Creek
CONLEY RD
CONLEY RD
Mccarthy Creek
Spruce Lake
GG
FOREST RD 183
Blaser Creek
NAMAKAGON RD
Moquah Lake
TN RD 42
Brunsweiler River
Spider Lake
OLD GRADE RD
SNAKE TRAIL RD
FOREST RD 344
SPIDER LAKE RD
McCarthy Lake
Iron River
WILDERNESS RD
FOREST RD 193
FOREST RD 182
GG
JOB CORP RD
Chippewa Lake
Duck Lake
Mud Lake
FOREST RD 182
West Twin Lake
East Twin Lake
Day Lake
Dingdong Creek
FOREST RD 347
M
White Bass Lake
FOREST RD 195
Woodtick Lake
LAKE FIVE RD
Muskie Springs Lake
Range Line Lake
West Fork Chippewa River
Buffalo Lake
Cranberry Lake
Red Ike Creek
BUFFALO LAKE RD
Upper Clam Lake
77
Dead Horse Slough
77
TEWES RD
Little Clam Lake
Hadley Lake
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,230


REGIONAL FLOOD STUDY
T43 & 44N, R3W, ASHLAND COUNTY
C. MELLEN
T. ASHLAND
T. MARENGO
T. MORSE
T. GORDON
T. SHANAGOLDEN
KORNSTEAD RD
HANSON RD
RASMUSON RD
QUARRY RD
N FOLEY RD (I)
W LAKE DR
LAKE DR
CONLEY RD
LONG LAKE RD
FOREST RD 183
FOREST RD 354
THOLE RD
MORSE RD
SCHOCH RD
FOREST RD 182
FOREST RD 181
FOREST RD 347
TEWES RD
HENNES RD
WILDE RD
EDER RD
GG
13
77
Beaverdam Lake
Lake Three
Trout Brook
English Lake
Brunsweiler River
John Frank Lake
Potter Lake
Mineral Lake
Camp Six Creek
Hardscrabble Creek
Bad River
City Creek
Beaver Lake
Meder Lake
Long Lake
Minnow Creek
Ellies Creek
Mecarthy Creek
Brush Creek
McCarthy Lake
Iron River
Spillerberg Lake
East Twin Lake
Dingdong Creek
Dead Horse Slough
Moose River
Dryden Creek
Torrey Lake
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,280



REGIONAL FLOOD STUDY
T43 & 44N, R2W, ASHLAND COUNTY
T. ASHLAND
C. MELLEN
T. MORSE
T. ANDERSON
T. GORDON
T. JACOBS
T. SHANAGOLDEN
T. PEEKSVILLE
KORNSTEAD RD
N FOLEY RD (I)
LAKE DR
W LAKE DR
LAKE CAROLINE RD
CAROLINE LAKE RD
MORSE LINE RD
CONLEY RD
LONG LAKE RD
TROUT RD
MINNIE CREEK RD
LONG LAKE RD
FOREST RD 354
THOLE RD
MORSE RD
MINNOW CREEK RD
DRY LAKE RD
OLD MORSE RD
SCHOCH RD
NIG REIN RD
CAMP K RD
CAMP E RD
FOREST RD 181
ERNEST RD
HANNES RD
OLD MORSE RD
HENNES RD
MACKENBERG RD
THUNDERSTICK RD
THORP RD
GEAR RD
WILDE RD
CHARLES WOLF RD
KINNEY RD
City Creek
Bad River
Beaver Lake
Meder Lake
Snowshoe Lake
Dollar Lake
Lake Galilee
Eureka Lake
East Twin Lake
Twin Lakes
Caroline Lake
McCarthy Lake
Maki Lake
Tyler Forks
Long Lake
Minnow Creek
Minnie Creek
Dry Lake
Ditmans Lake
Magee Creek
Knab Lake
Wolf Lake
Spillerberg Lake
Spillerberg Creek
Summit Lake
Gordon Lake
Torrey Lake
Dryden Creek
East Fork Chippewa River
77
13
N
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,900
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
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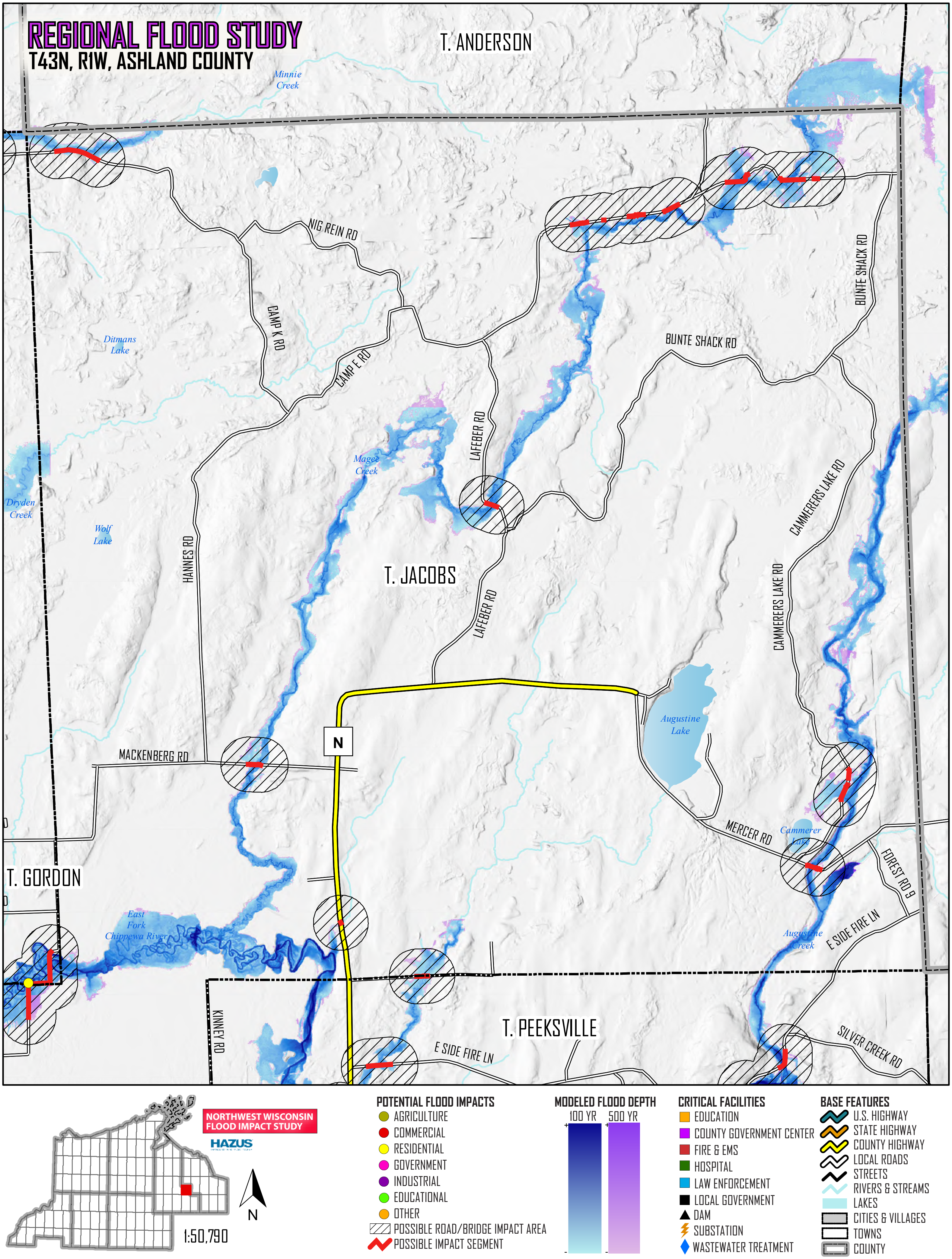
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T43N, R1W, ASHLAND COUNTY
T. ANDERSON
T. JACOBS
T. GORDON
T. PEEKSVILLE
Minnie Creek
Ditmans Lake
Dryden Creek
Wolf Lake
Magee Creek
Augustine Lake
Cammerer Lake
Augustine Creek
East Fork Chippewa River
NIG REIN RD
CAMP K RD
CAMP E RD
LAFEBER RD
BUNTE SHACK RD
CAMMERERS LAKE RD
HANNES RD
MACKENBERG RD
MERCER RD
FOREST RD 9
E SIDE FIRE LN
SILVER CREEK RD
KINNEY RD
N
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
1:50,790
N
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
+
-
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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RIVERS & STREAMS
LAKES
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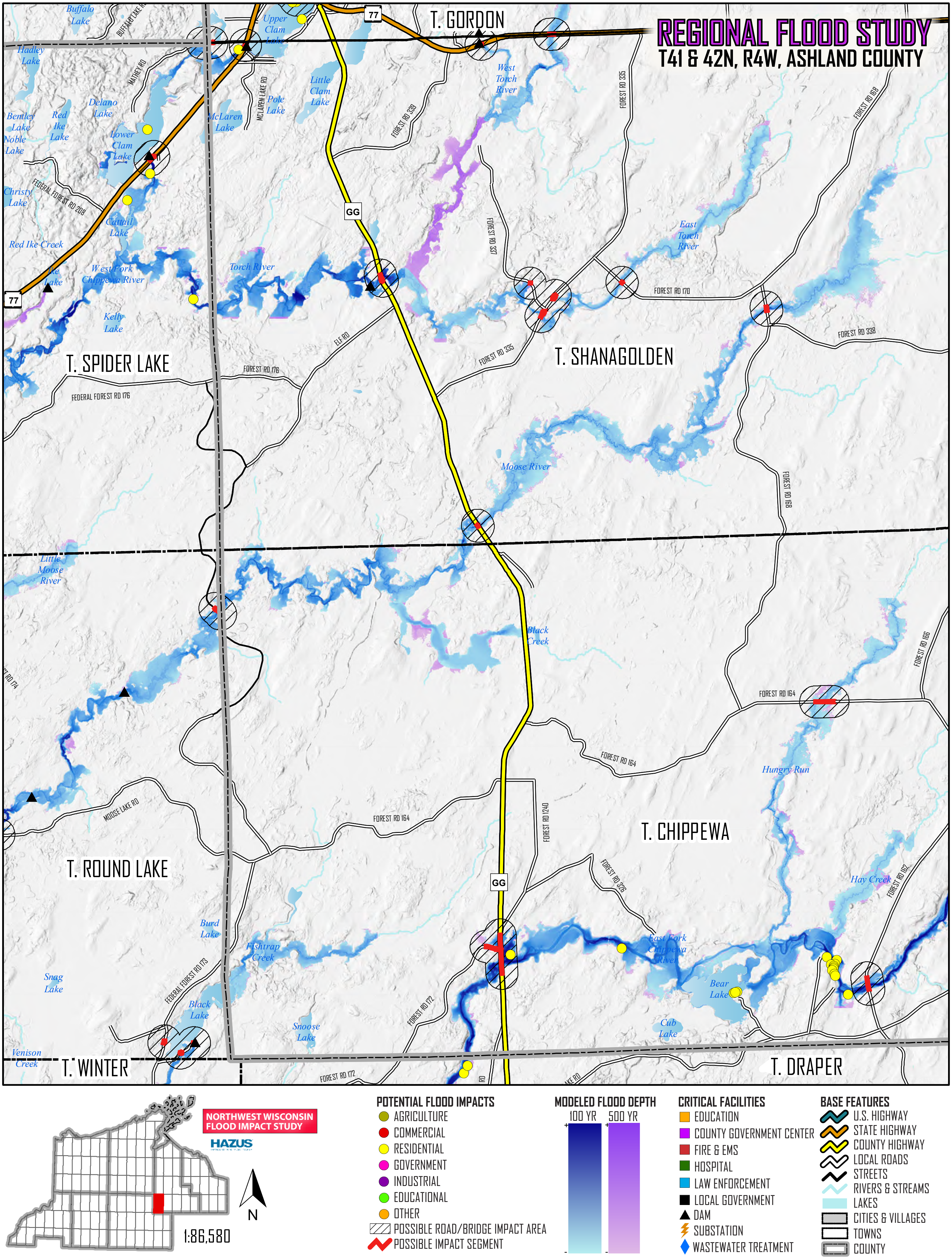
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R4W, ASHLAND COUNTY
T. GORDON
T. SPIDER LAKE
T. SHANAGOLDEN
T. CHIPPEWA
T. ROUND LAKE
T. WINTER
T. DRAPER
Buffalo Lake
Hadley Lake
Upper Clam Lake
Little Clam Lake
Pole Lake
McLaren Lake
Delano Lake
Bentley Lake
Red Ike Lake
Noble Lake
Lower Clam Lake
Christy Lake
Cattail Lake
Red Ike Creek
Ike Lake
West Fork Chippewa River
Torch River
Kelly Lake
West Torch River
East Torch River
Moose River
Little Moose River
Black Creek
Hungry Run
Hay Creek
Burd Lake
Fishtrap Creek
Snag Lake
Black Lake
Snoose Lake
Venison Creek
East Fork Chippewa River
Bear Lake
Cub Lake
77
GG
MATHEY RD
MCLAREN LAKE RD
FOREST RD 339
FOREST RD 335
FOREST RD 337
FOREST RD 168
FOREST RD 170
FOREST RD 338
FOREST RD 176
FEDERAL FOREST RD 176
FEDERAL FOREST RD 208
ELF RD
FOREST RD 164
FOREST RD 166
FOREST RD 1240
FOREST RD 3216
FOREST RD 162
FOREST RD 172
FEDERAL FOREST RD 173
MOOSE LAKE RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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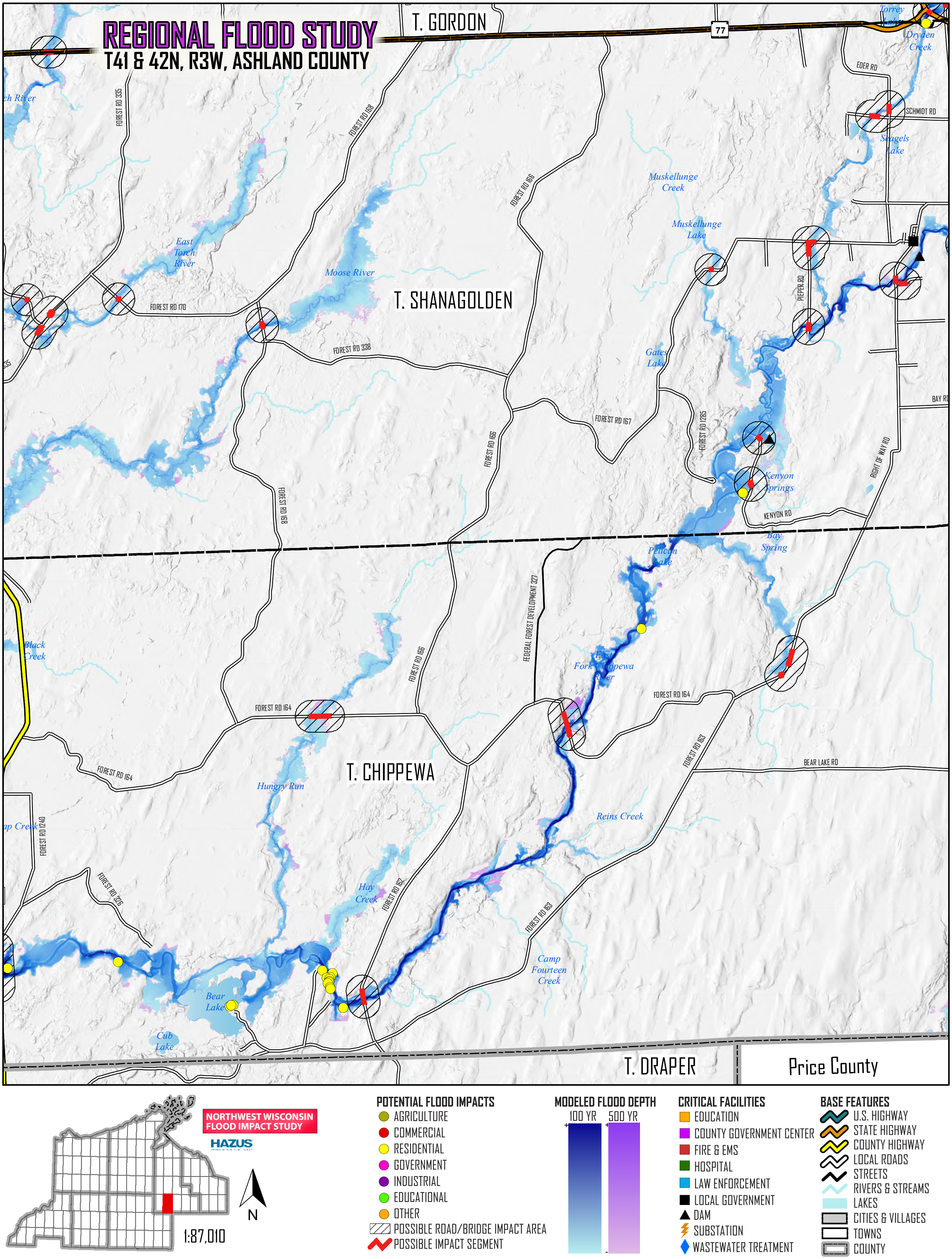
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R3W, ASHLAND COUNTY
T. GORDON
T. SHANAGOLDEN
T. CHIPPEWA
T. DRAPER
Price County
77
FOREST RD 335
FOREST RD 168
FOREST RD 170
FOREST RD 338
FOREST RD 166
FOREST RD 167
FOREST RD 1285
FOREST RD 164
FOREST RD 163
FOREST RD 162
FOREST RD 326
FOREST RD 1240
FEDERAL FOREST DEVELOPMENT 327
RIGHT OF WAY RD
PIEPER RD
EDER RD
SCHMIDT RD
BAY RD
KENYON RD
BEAR LAKE RD
East Torch River
Moose River
Muskellunge Creek
Muskellunge Lake
Gates Lake
Kenyon Springs
Bay Spring
Pelican Lake
Seagels Lake
Dryden Creek
Black Creek
Hungry Run
Hay Creek
Reins Creek
Camp Fourteen Creek
Bear Lake
Cub Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
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COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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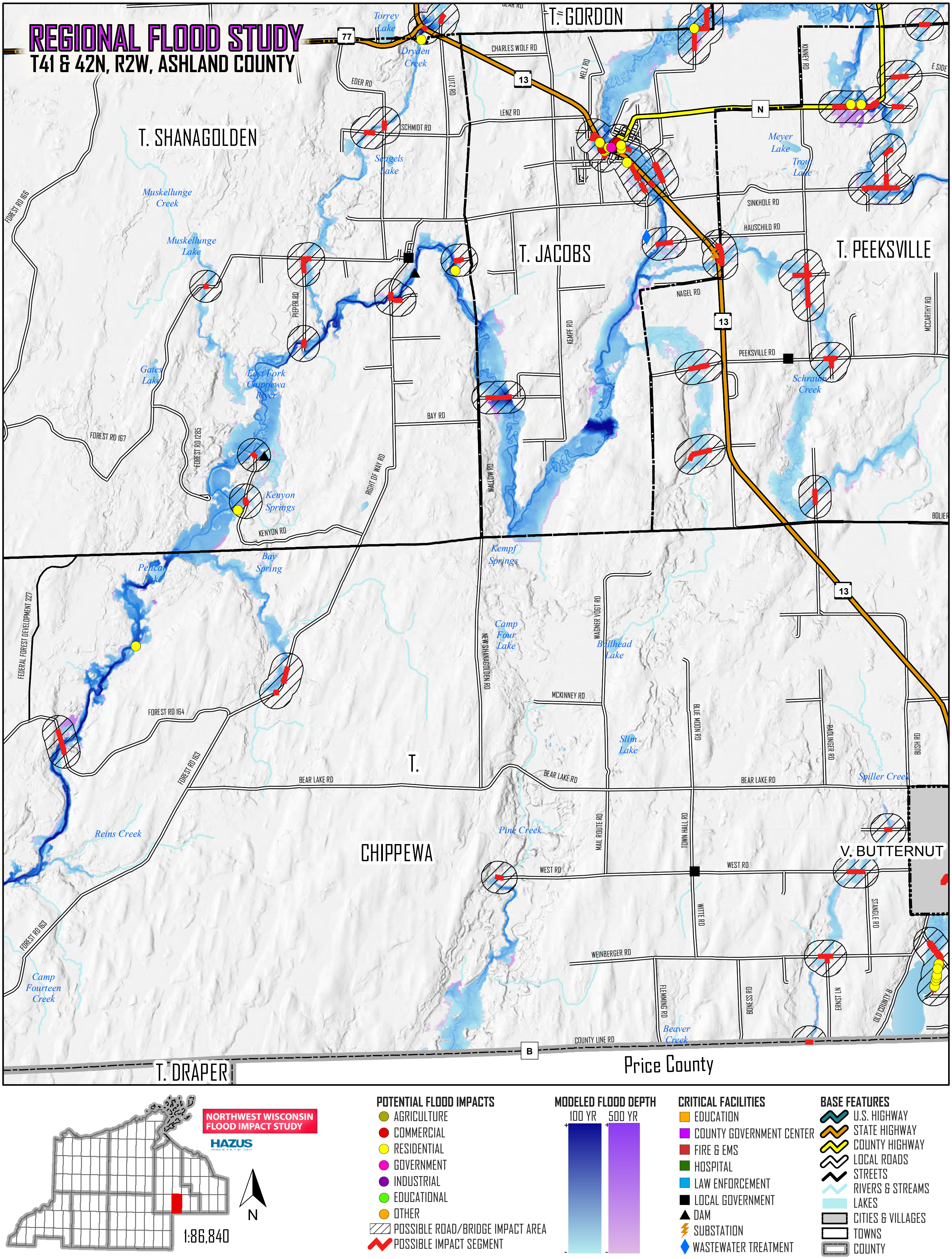
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R2W, ASHLAND COUNTY
T. GORDON
T. SHANAGOLDEN
T. JACOBS
T. PEEKSVILLE
T. CHIPPEWA
V. BUTTERNUT
T. DRAPER
Price County
77
13
N
B
CHARLES WOLF RD
EDER RD
LUTZ RD
MELZ RD
KINNEY RD
E SIDE
LENZ RD
SCHMIDT RD
SINKHOLE RD
HAUSCHILD RD
NAGEL RD
PEEKSVILLE RD
MCCARTHY RD
PIEPER RD
KEMPF RD
BAY RD
WALLOW RD
RIGHT OF WAY RD
KENYON RD
FOREST RD 166
FOREST RD 167
FOREST RD 1285
FOREST RD 164
FOREST RD 163
FEDERAL FOREST DEVELOPMENT 327
NEW SHANAGOLDEN RD
WAGNER VOGT RD
MCKINNEY RD
BLUE MOON RD
RADLINGER RD
BUSH RD
BEAR LAKE RD
MAIL ROUTE RD
TOWN HALL RD
WEST RD
WITTE RD
STANGLE RD
WEINBERGER RD
FLEMMING RD
BONESS RD
ERNST LN
OLD COUNTY B
COUNTY LINE RD
BOLIER
Torrey Lake
Dryden Creek
Sengels Lake
Meyer Lake
Trout Lake
Muskellunge Creek
Muskellunge Lake
Gates Lake
East Fork Chippewa River
Kenyon Springs
Bay Spring
Pelican Lake
Kempf Springs
Schraum Creek
Camp Four Lake
Bullhead Lake
Slim Lake
Spiller Creek
Reins Creek
Pine Creek
Camp Fourteen Creek
Beaver Creek
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
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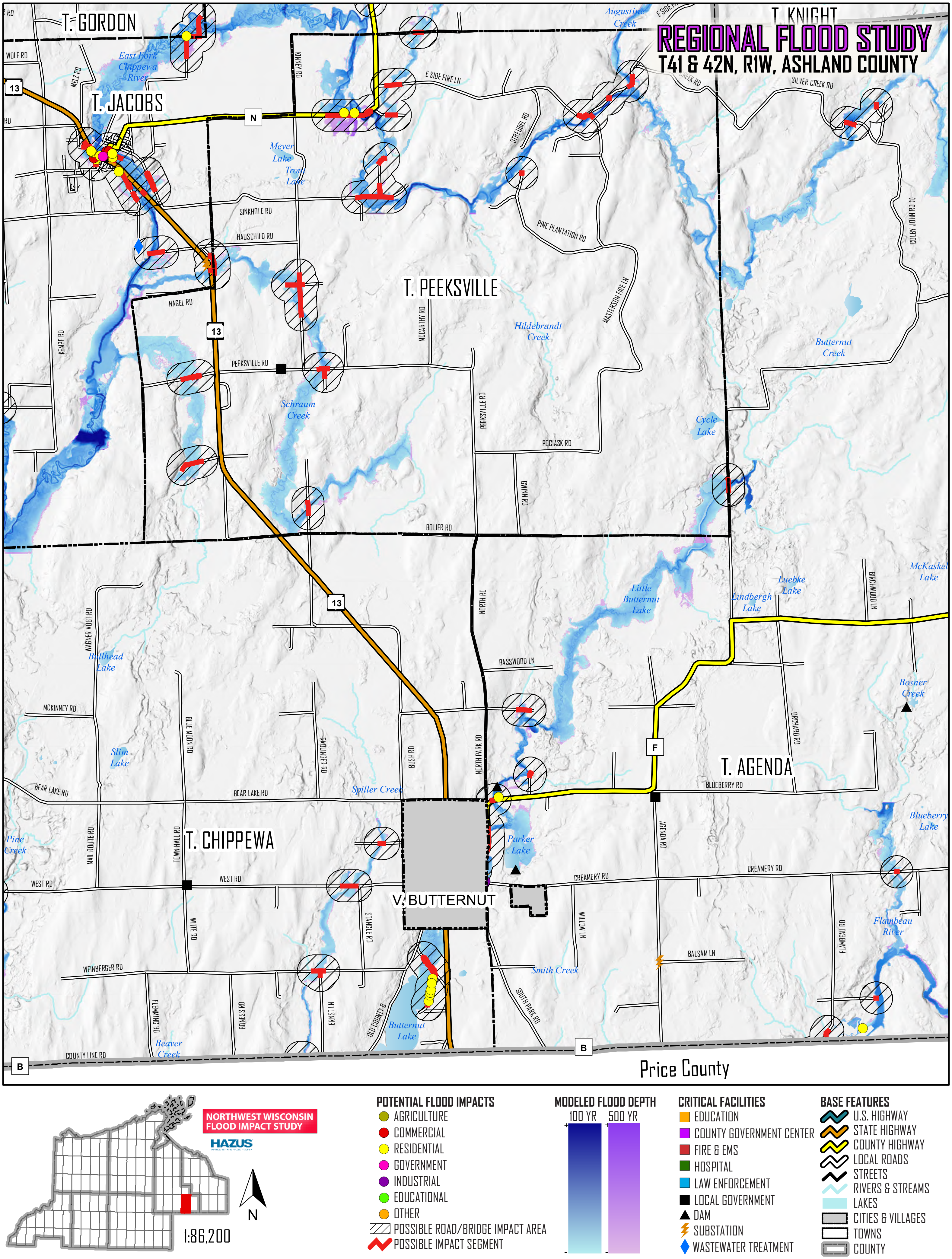
REGIONAL FLOOD STUDY
T41 & 42N, R1W, ASHLAND COUNTY
T. GORDON
T. KNIGHT
T. JACOBS
T. PEEKSVILLE
T. CHIPPEWA
T. AGENDA
V. BUTTERNUT
Price County
East Fork Chippewa River
Augustine Creek
Meyer Lake
Trout Lake
Hildebrandt Creek
Butternut Creek
Schraum Creek
Cycle Lake
Little Butternut Lake
Lindbergh Lake
Luebke Lake
McKaskel Lake
Bullhead Lake
Slim Lake
Spiller Creek
Bosner Creek
Parker Lake
Blueberry Lake
Pine Creek
Flambeau River
Smith Creek
Butternut Lake
Beaver Creek
WOLF RD
MELZ RD
KINNEY RD
E SIDE FIRE LN
SILVER CREEK RD
STREUBEL RD
SINKHOLE RD
HAUSCHILD RD
PINE PLANTATION RD
COLBY JOHN RD
NAGEL RD
MASTERSON FIRE LN
MCCARTHY RD
KEMPF RD
PEEKSVILLE RD
PEEKSVILLE RD
POCIASK RD
GWINN RD
BOLIER RD
NORTH RD
BIRCHWOOD LN
WAGNER VOGT RD
BASSWOOD LN
MCKINNEY RD
BLUE MOON RD
RADLINGER RD
BUSH RD
NORTH PARK RD
ORCHARD RD
BEAR LAKE RD
BEAR LAKE RD
BLUEBERRY RD
MAIL ROUTE RD
TOWN HALL RD
AGENDA RD
WEST RD
WEST RD
CREAMERY RD
CREAMERY RD
WITTE RD
STANGLE RD
WILLOW LN
FLAMBEAU RD
BALSAM LN
WEINBERGER RD
FLEMMING RD
BONESS RD
ERNST LN
OLD COUNTY B
SOUTH PARK RD
COUNTY LINE RD
13
N
F
B
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
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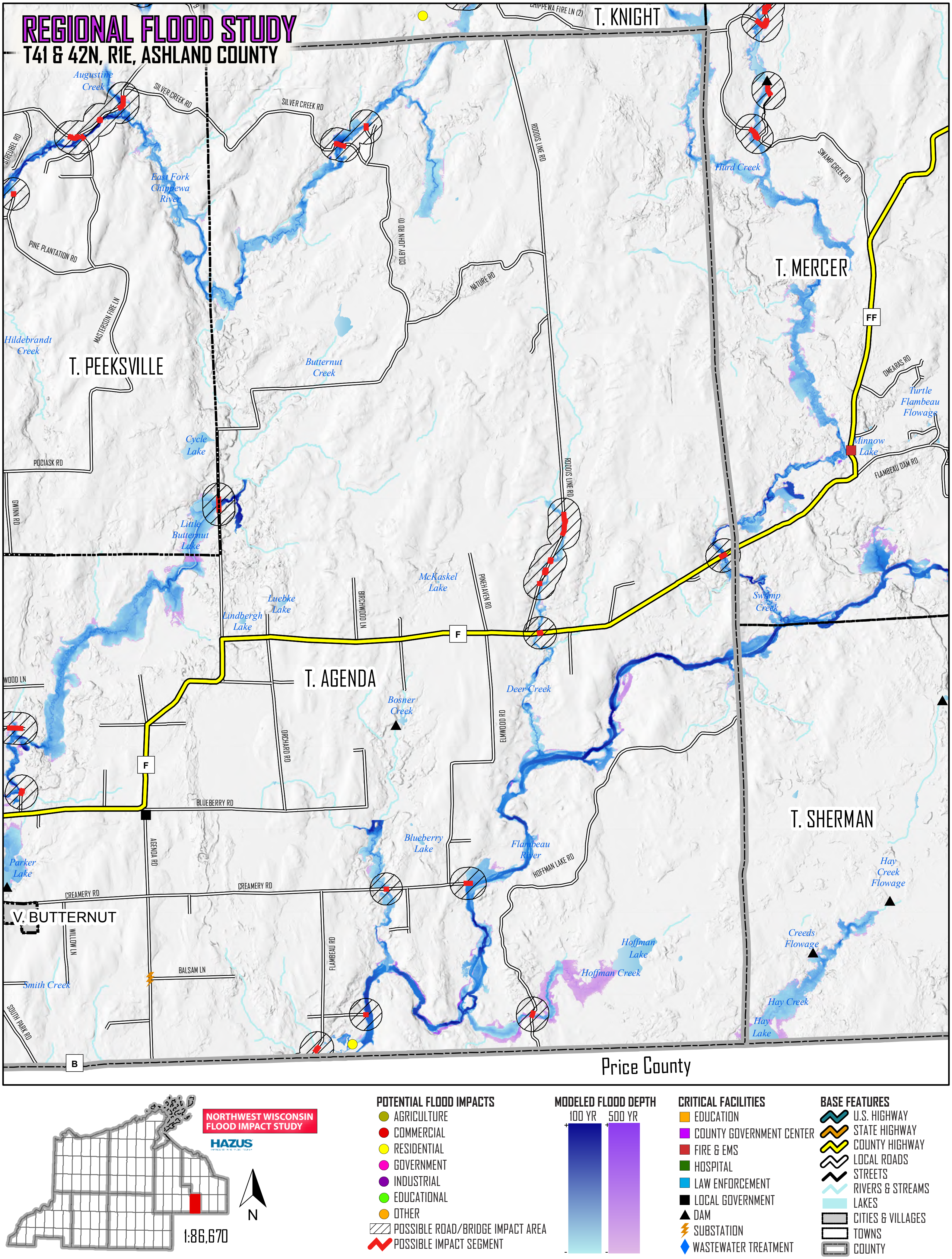

REGIONAL FLOOD STUDY
T41 & 42N, R1E, ASHLAND COUNTY
T. KNIGHT
T. PEEKSVILLE
T. MERCER
T. AGENDA
T. SHERMAN
V. BUTTERNUT
Price County
Augustine Creek
East Fork Chippewa River
Hildebrandt Creek
Butternut Creek
Cycle Lake
Little Butternut Lake
Hurd Creek
Turtle Flambeau Flowage
Minnow Lake
Swamp Creek
McKaskel Lake
Luebke Lake
Lindbergh Lake
Deer Creek
Bosner Creek
Blueberry Lake
Flambeau River
Parker Lake
Smith Creek
Hoffman Lake
Hoffman Creek
Hay Creek Flowage
Creeds Flowage
Hay Creek
Hay Lake
SILVER CREEK RD
CHIPPEWA FIRE LN (2)
RODDIS LINE RD
SWAMP CREEK RD
STREUBEL RD
PINE PLANTATION RD
MASTERSON FIRE LN
COLBY JOHN RD (1)
NATURE RD
OMEARAS RD
FLAMBEAU DAM RD
POCIASK RD
GWINN RD
BIRCHWOOD LN
PINEHAVEN RD
WOOD LN
ORCHARD RD
ELMWOOD RD
BLUEBERRY RD
AGENDA RD
HOFFMAN LAKE RD
CREAMERY RD
WILLOW LN
BALSAM LN
FLAMBEAU RD
SOUTH PARK RD
FF
F
B
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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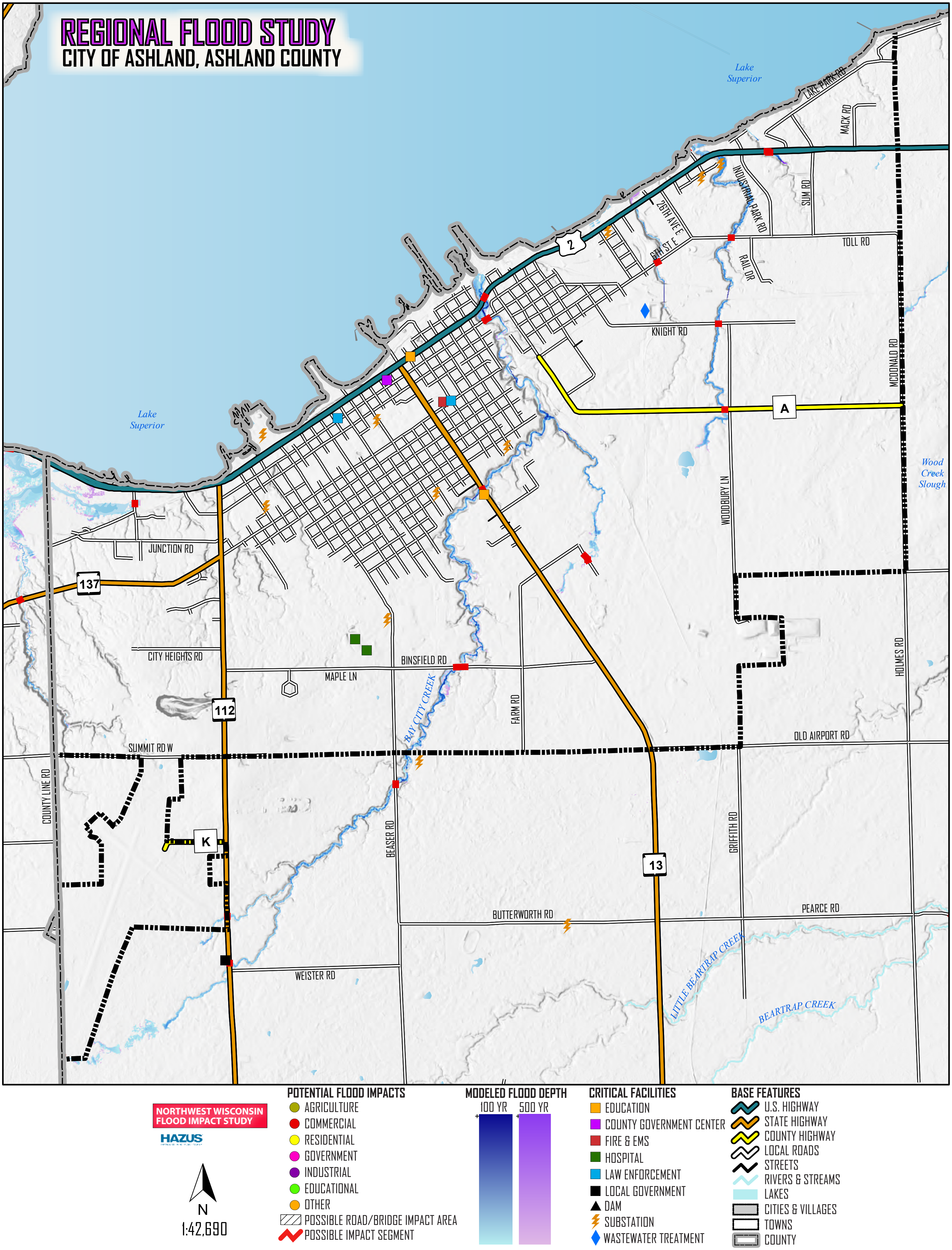
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
CITY OF ASHLAND, ASHLAND COUNTY
Lake Superior
Lake Superior
Wood Creek Slough
LAKE PARK RD
MACK RD
SUM RD
INDUSTRIAL PARK RD
28TH AVE E
6TH ST E
TOLL RD
RAIL DR
KNIGHT RD
MCDONALD RD
A
2
JUNCTION RD
137
CITY HEIGHTS RD
BINSFIELD RD
MAPLE LN
BAY CITY CREEK
112
FARM RD
WOODBURY LN
HOLMES RD
SUMMIT RD W
OLD AIRPORT RD
COUNTY LINE RD
K
BEASER RD
GRIFFITH RD
13
BUTTERWORTH RD
PEARCE RD
WEISTER RD
LITTLE BEARTRAP CREEK
BEARTRAP CREEK
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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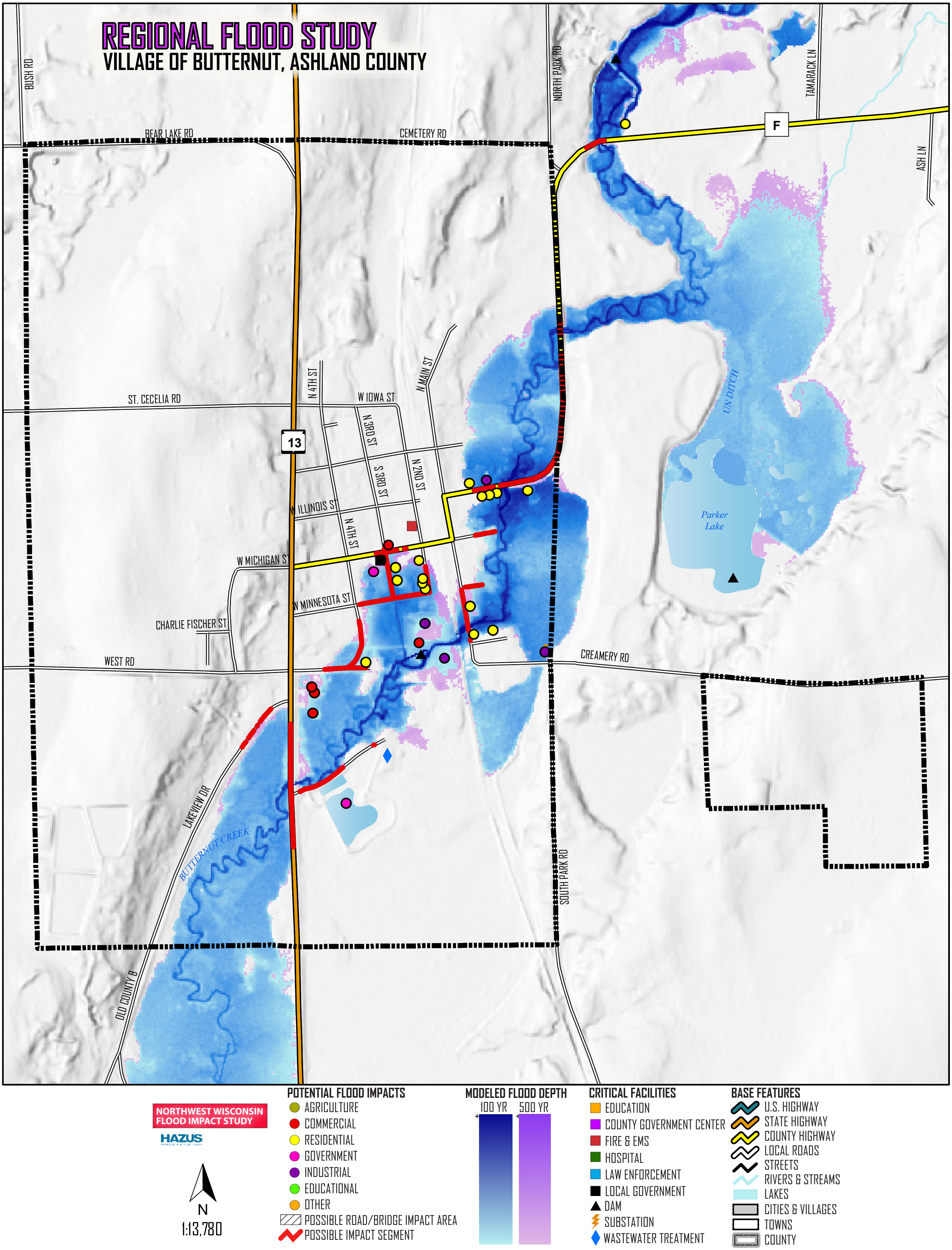
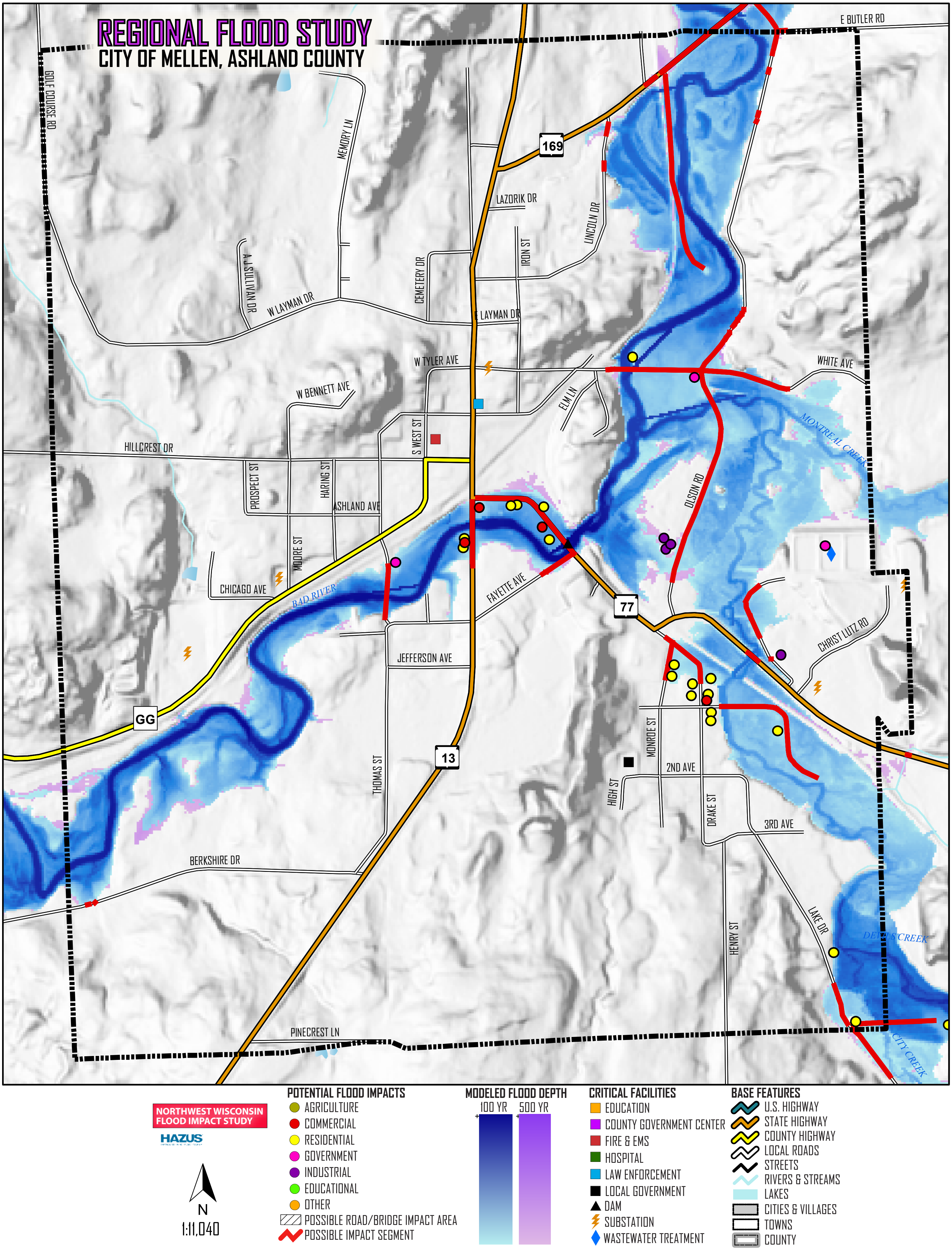
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF BUTTERNUT, ASHLAND COUNTY
BUSH RD
BEAR LAKE RD
CEMETERY RD
NORTH PARK RD
TAMARACK LN
ASH LN
F
ST. CECELIA RD
N 4TH ST
W IOWA ST
N MAIN ST
N 3RD ST
S 3RD ST
N 2ND ST
13
W ILLINOIS ST
N 4TH ST
W MICHIGAN ST
W MINNESOTA ST
CHARLIE FISCHER ST
WEST RD
CREAMERY RD
UN DITCH
Parker Lake
LAKEVIEW DR
BUTTERNUT CREEK
SOUTH PARK RD
OLD COUNTY B
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:13,780
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
CITY OF MELLEN, ASHLAND COUNTY
E BUTLER RD
GOLF COURSE RD
MEMORY LN
169
LAZORIK DR
LINCOLN DR
IRON ST
A J SULLIVAN DR
W LAYMAN DR
CEMETERY DR
E LAYMAN DR
W TYLER AVE
WHITE AVE
W BENNETT AVE
ELM LN
MONTREAL CREEK
HILLCREST DR
S WEST ST
PROSPECT ST
HARING ST
ASHLAND AVE
OLSON RD
MOORE ST
CHICAGO AVE
BAD RIVER
FAYETTE AVE
77
JEFFERSON AVE
CHRIST LUTZ RD
GG
13
THOMAS ST
MONROE ST
2ND AVE
HIGH ST
DRAKE ST
3RD AVE
BERKSHIRE DR
LAKE DR
HENRY ST
DEVILS CREEK
PINECREST LN
CITY CREEK
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

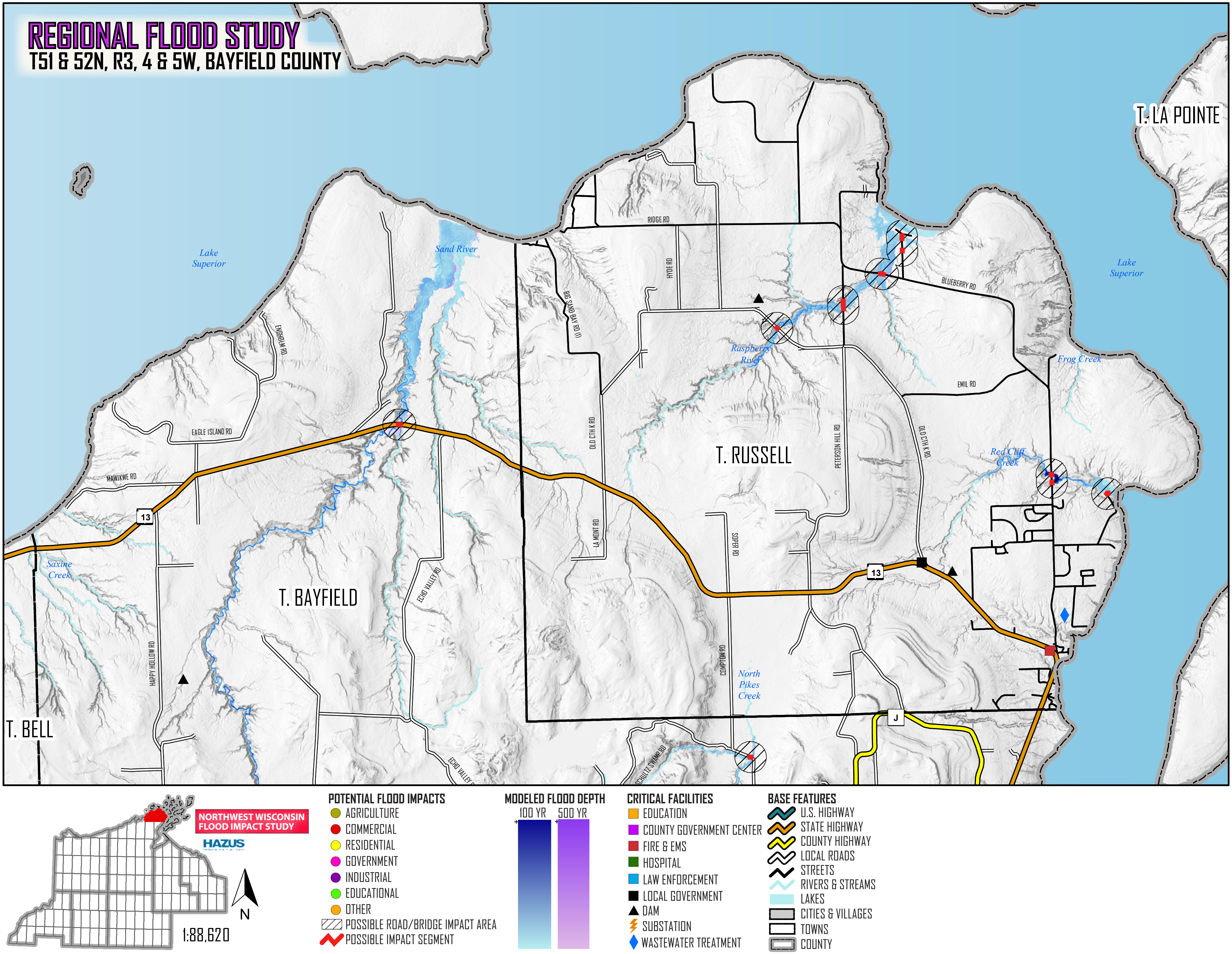
BAYFIELD COUNTY

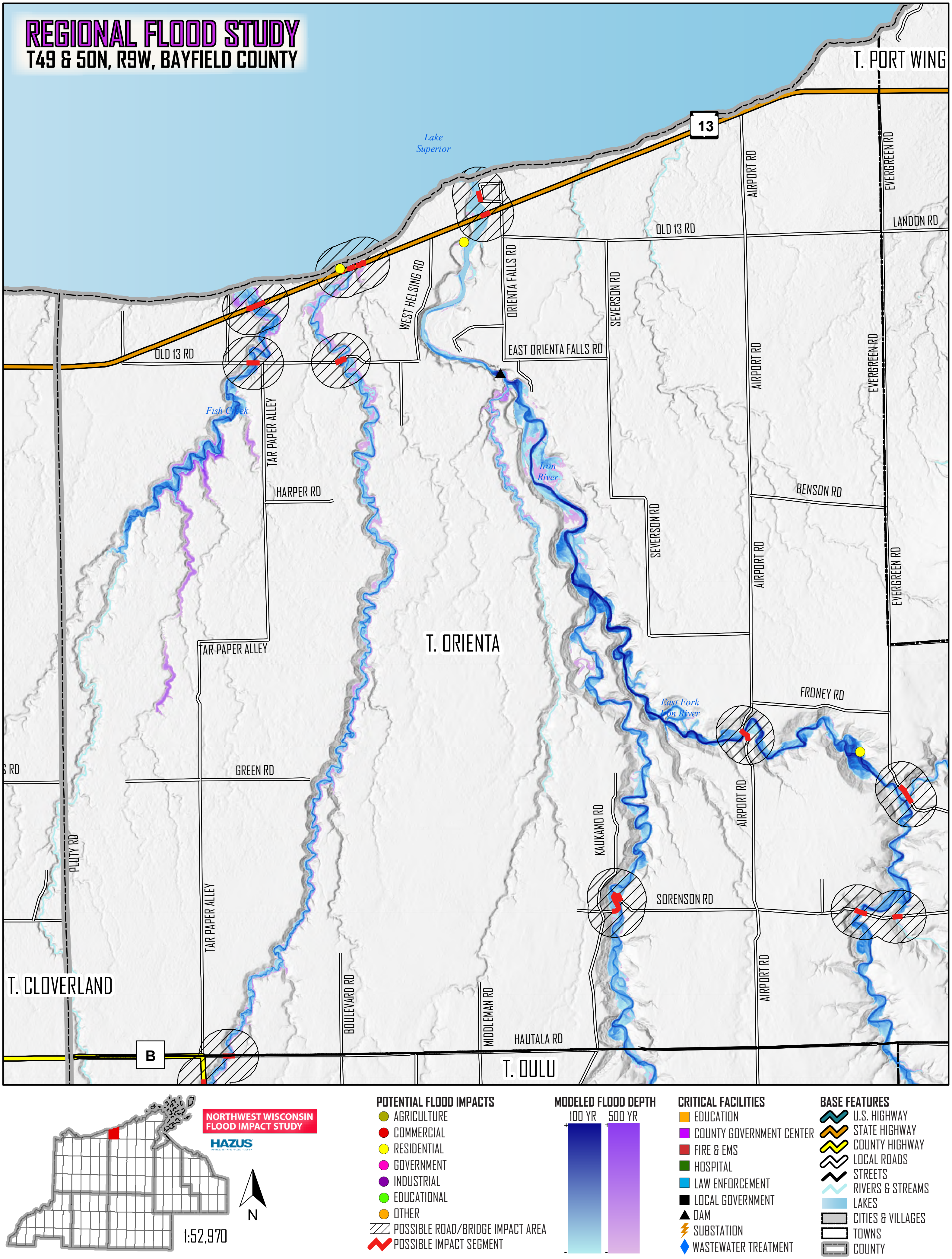
HAZUS 100-YEAR FLOOD LOSS ESTIMATES - BAYFIELD COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
T. OF BARKSDALE	3	$ 3,160.00	$ 1,252.00	$ -	31
T. OF BARNES	25	$ 386,859.00	$ 137,575.00	$ -	313
T. OF BAYFIELD	2	$ 30,064.00	$ 9,891.00	$ -	17
T. OF BAYVIEW	1	$ -	$ -	$ -	6
T. OF BELL	7	$ 844.00	$ 9,553.00	$ -	44
T. OF CABLE	2	$ 24,705.00	$ 8,864.00	$ -	6
T. OF CLOVER	6	$ 32,384.00	$ 11,146.00	$ -	44
T. OF DELTA	2	$ 54,462.00	$ 17,211.00	$ -	15
T. OF DRUMMOND	8	$ 127,962.00	$ 47,133.00	$ -	84
T. OF GRAND VIEW	3	$ 15,400.00	$ 4,026.00	$ -	36
T. OF IRON RIVER	2	$ 28,498.00	$ 12,049.00	$ -	20
T. OF KELLY	1	$ 18,585.00	$ 14,018.00	$ -	27
T. OF KEYSTONE	1	$ 1,680.00	$ 161.00	$ -	41
T. OF LINCOLN	7	$ 33,580.00	$ 12,866.00	$ -	48
T. OF ORIENTA	2	$ 15,115.00	$ 6,402.00	$ -	44
T. OF PORT WING	5	$ 16,898.00	$ 6,698.00	$ -	360
V. OF MASON	1	$ 6,580.00	$ 41,904.00	$ -	3
GRAND TOTAL	**78**	**$ 796,776.00**	**$ 340,749.00**	**$ -**	**1,139**

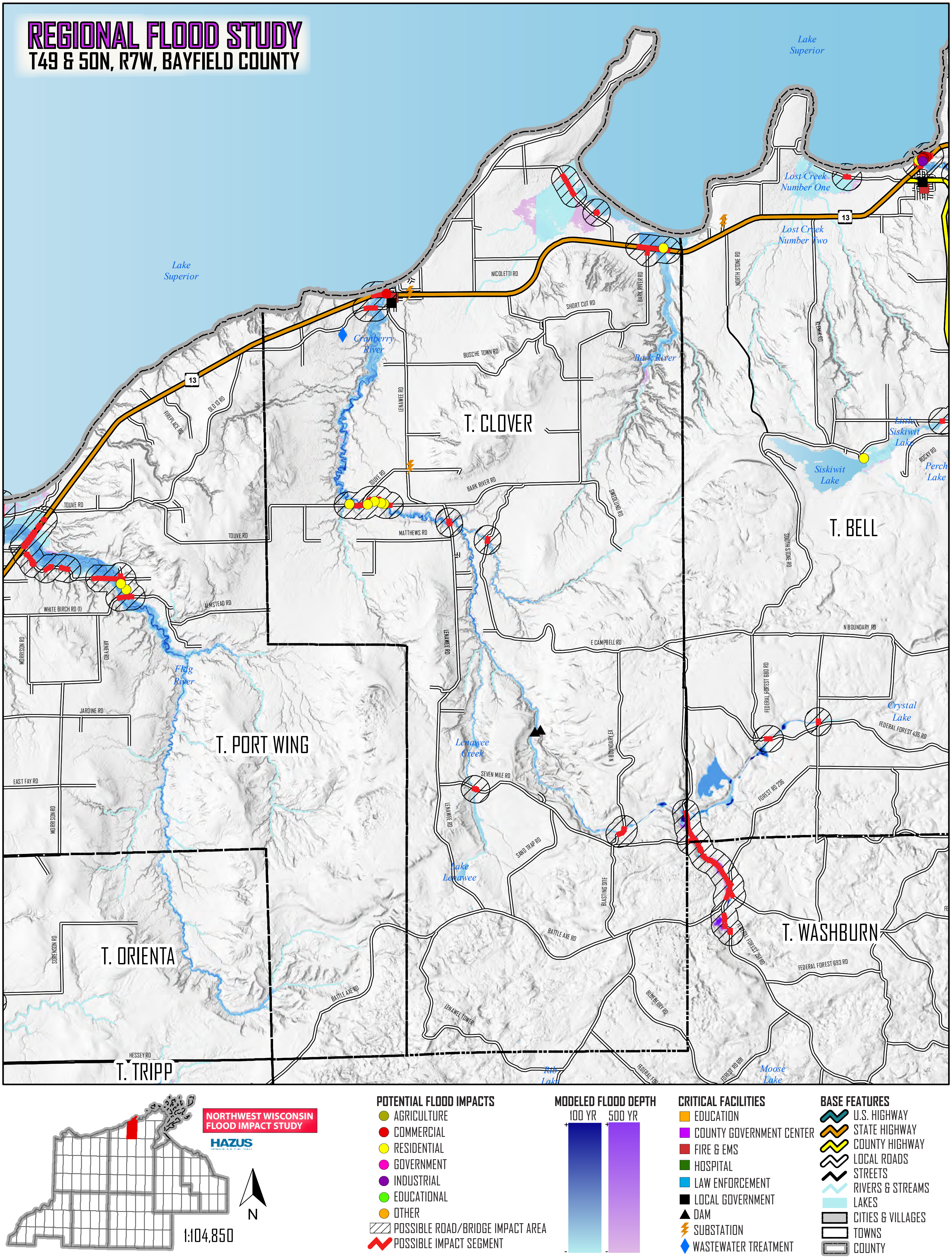
HAZUS 500-YEAR FLOOD LOSS ESTIMATES - BAYFIELD COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
T. OF BARKSDALE	3	$ 3,160.00	$ 1,245.00	$ 0	31
T. OF BARNES	37	$ 777,918.00	$ 271,633.00	$ 0	718
T. OF BAYFIELD	4	$ 66,238.00	$ 21,015.00	$ 0	40
T. OF BAYVIEW	2	$ 0	$ 0	$ 0	18
T. OF BELL	9	$ 2,785.00	$ 19,087.00	$ 0	46
T. OF CABLE	4	$ 45,260.00	$ 20,142.00	$ 0	25
T. OF CLOVER	7	$ 40,251.00	$ 12,818.00	$ 0	49
T. OF DELTA	3	$ 84,348.00	$ 27,697.00	$ 0	19
T. OF DRUMMOND	12	$ 197,339.00	$ 66,737.00	$ 0	121
T. OF EILEEN	1	$ 490.00	$ 980.00	$ 207.00	4
T. OF GRAND VIEW	4	$ 17,950.00	$ 6,897.00	$ 0	54
T. OF IRON RIVER	5	$ 247,964.00	$ 66,407.00	$ 0	142
T. OF KELLY	1	$ 21,468.00	$ 18,015.00	$ 0	27
T. OF KEYSTONE	1	$ 1,680.00	$ 161.00	$ 0	41
T. OF LINCOLN	7	$ 60,070.00	$ 18,486.00	$ 0	57
T. OF NAMAKAGON	2	$ 0	$ 0	$ 0	22
T. OF ORIENTA	2	$ 5,680.00	$ 2,304.00	$ 0	31
T. OF OULU	1	$ 0	$ 0	$ 0	2
T. OF PORT WING	7	$ 23,871.00	$ 8,798.00	$ 0	372
T. OF TRIPP	1	$ 6,236.00	$ 2,268.00	$ 0	26
V. OF MASON	1	$ 7,326.00	$ 47,000.00	$ 0	3
GRAND TOTAL	**114**	**$ 1,610,034.00**	**$ 611,690.00**	**$ 207.00**	**1848**

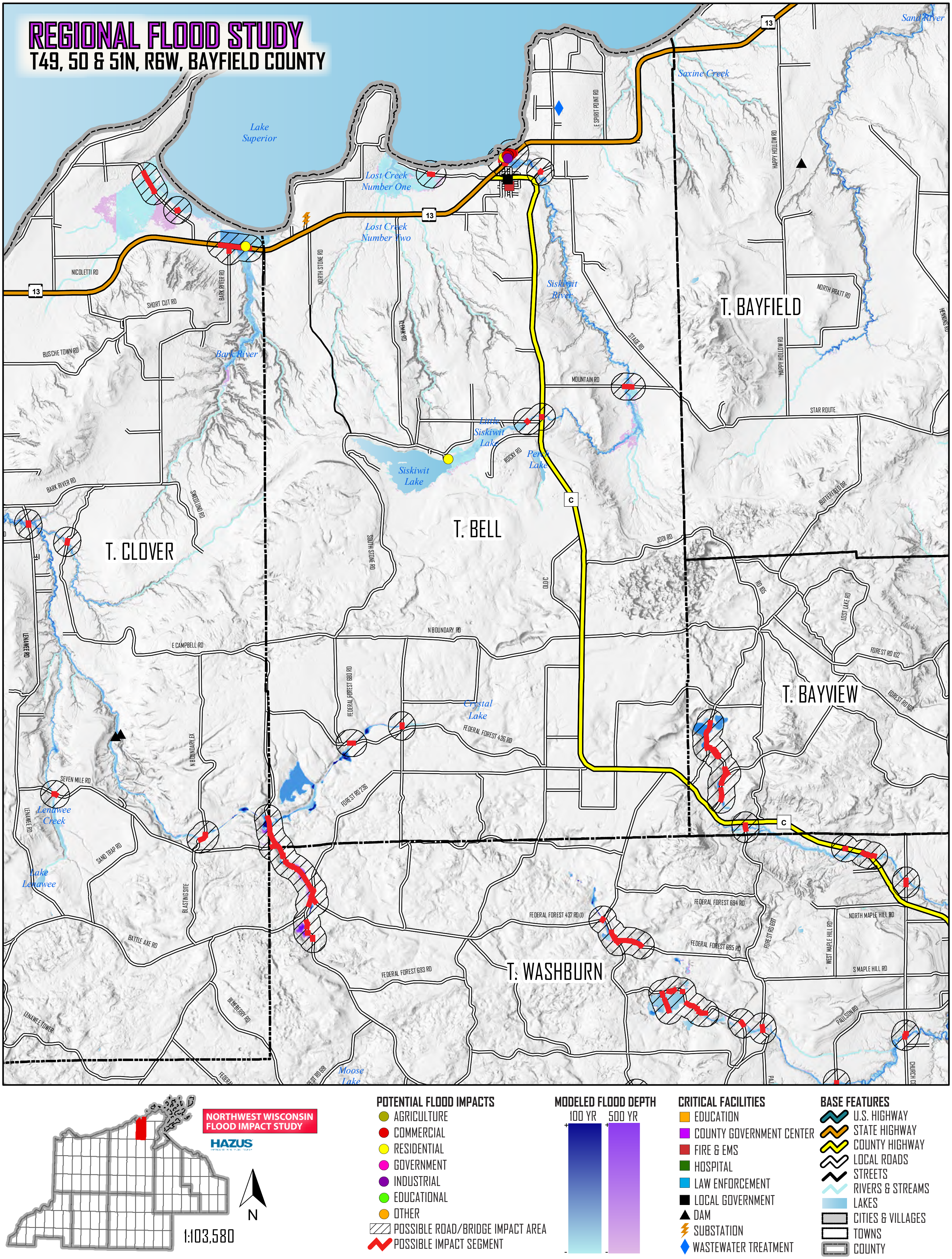

REGIONAL FLOOD STUDY
T51 & 52N, R3, 4 & 5W, BAYFIELD COUNTY
T. LA POINTE
T. RUSSELL
T. BAYFIELD
T. BELL
Lake Superior
Lake Superior
Sand River
Raspberry River
Frog Creek
Red Cliff Creek
Saxine Creek
North Pikes Creek
RIDGE RD
HYDE RD
BIG SAND BAY RD (I)
BLUEBERRY RD
EMIL RD
ENGHOLM RD
EAGLE ISLAND RD
MAWIKWE RD
OLD CTH K RD
LA MONT RD
PETERSON HILL RD
SUPER RD
COMPTON RD
ECHO VALLEY RD
HAPPY HOLLOW RD
SCHULTZ SWAMP RD
13
13
J
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:88,620
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T49 & 50N, R9W, BAYFIELD COUNTY
T. PORT WING
Lake Superior
13
OLD 13 RD
LANDON RD
EVERGREEN RD
AIRPORT RD
SEVERSON RD
ORIENTA FALLS RD
WEST HELSING RD
EAST ORIENTA FALLS RD
Fish Creek
TAR PAPER ALLEY
HARPER RD
Iron River
BENSON RD
T. ORIENTA
FRONEY RD
East Fork Iron River
GREEN RD
KAUKAMO RD
SORENSON RD
PLUTY RD
T. CLOVERLAND
BOULEVARD RD
MIDDLEMAN RD
HAUTALA RD
B
T. OULU
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:52,970
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T49 & 50N, R8W, BAYFIELD COUNTY
Lake Superior
T. CLOVER
T. ORIENTA
T. PORT WING
T. OULU
T. TRIPP
T. WASHBURN
Cranberry River
Flag River
Iron River
Kolin Creek
East Fork Iron River
13
A
TOUVE RD
OLD 13 RD
FIREPLACE RD
LENAWEE RD
MATT
WHITE BIRCH RD (I)
ALMSTEAD RD
AIRPORT RD
EVERGREEN RD
LANDON RD
SEVERSON RD
MORRISON RD
ARNEY RD
BECKMAN RD
JARDINE RD
BENSON RD
WEST FAY RD
EAST FAY RD
SOUTH FAY RD
PORT WING LINE RD
FRONEY RD
SORENSON RD
BATTLE AXE RD
HESSEY RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:76,990
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T49 & 50N, R7W, BAYFIELD COUNTY
Lake Superior
Lake Superior
T. CLOVER
T. BELL
T. PORT WING
T. WASHBURN
T. ORIENTA
T. TRIPP
Cranberry River
Bark River
Flag River
Lenawee Creek
Lake Lenawee
Lost Creek Number One
Lost Creek Number Two
Little Siskiwit Lake
Siskiwit Lake
Perch Lake
Crystal Lake
Moose Lake
13
NICOLETTI RD
SHORT CUT RD
BARK RIVER RD
NORTH STONE RD
BUSCHE TOWN RD
LENAWEE RD
OLD 13 RD
FIREPLACE RD
TOUVE RD
BARK RIVER RD
MATTHEWS RD
SWEDLUND RD
SOUTH STONE RD
ROCKY RD
WHITE BIRCH RD
ALMSTEAD RD
E CAMPBELL RD
N BOUNDARY RD
MORRISON RD
ARNEY RD
JARDINE RD
EAST FAY RD
FEDERAL FOREST 680 RD
FEDERAL FOREST 436 RD
N BOUNDARY EX
SEVEN MILE RD
FOREST RD 236
SAND TRAP RD
BLASTING SITE
BATTLE AXE RD
FEDERAL FOREST 251 RD
FEDERAL FOREST 693 RD
SORENSON RD
BATTLE AXE RD
LENAWEE TOWER
BLUEBERRY RD
HESSEY RD
FOREST RD 691
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:104,850
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T49, 50 & 51N, R6W, BAYFIELD COUNTY
Lake Superior
Lost Creek Number One
Lost Creek Number Two
Saxine Creek
Sand River
Siskiwit River
Bark River
Little Siskiwit Lake
Siskiwit Lake
Perch Lake
Crystal Lake
Lenawee Creek
Lake Lenawee
Moose Lake
T. BAYFIELD
T. BELL
T. CLOVER
T. BAYVIEW
T. WASHBURN
13
C
NICOLETTI RD
SHORT CUT RD
BUSCHE TOWN RD
BARK RIVER RD
NORTH STONE RD
E SPIRIT POINT RD
HAPPY HOLLOW RD
NORTH PRATT RD
STAGE RD
MOUNTAIN RD
STAR ROUTE
ROCKY RD
BUTTERFIELD DR
JODI RD
SOUTH STONE RD
OLD C
N BOUNDARY RD
E CAMPBELL RD
LENAWEE RD
LOST LAKE RD
FOREST RD 102
FOREST RD 108
FEDERAL FOREST 436 RD
FOREST RD 236
SEVEN MILE RD
SAND TRAP RD
BLASTING SITE
BATTLE AXE RD
FEDERAL FOREST 437 RD
FEDERAL FOREST 694 RD
FEDERAL FOREST 695 RD
FEDERAL FOREST 693 RD
NORTH MAPLE HILL RD
WEST MAPLE HILL RD
S MAPLE HILL RD
PAULSON RD
BLUEBERRY RD
LENAWEE TOWER
CHURCH CO
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:103,580
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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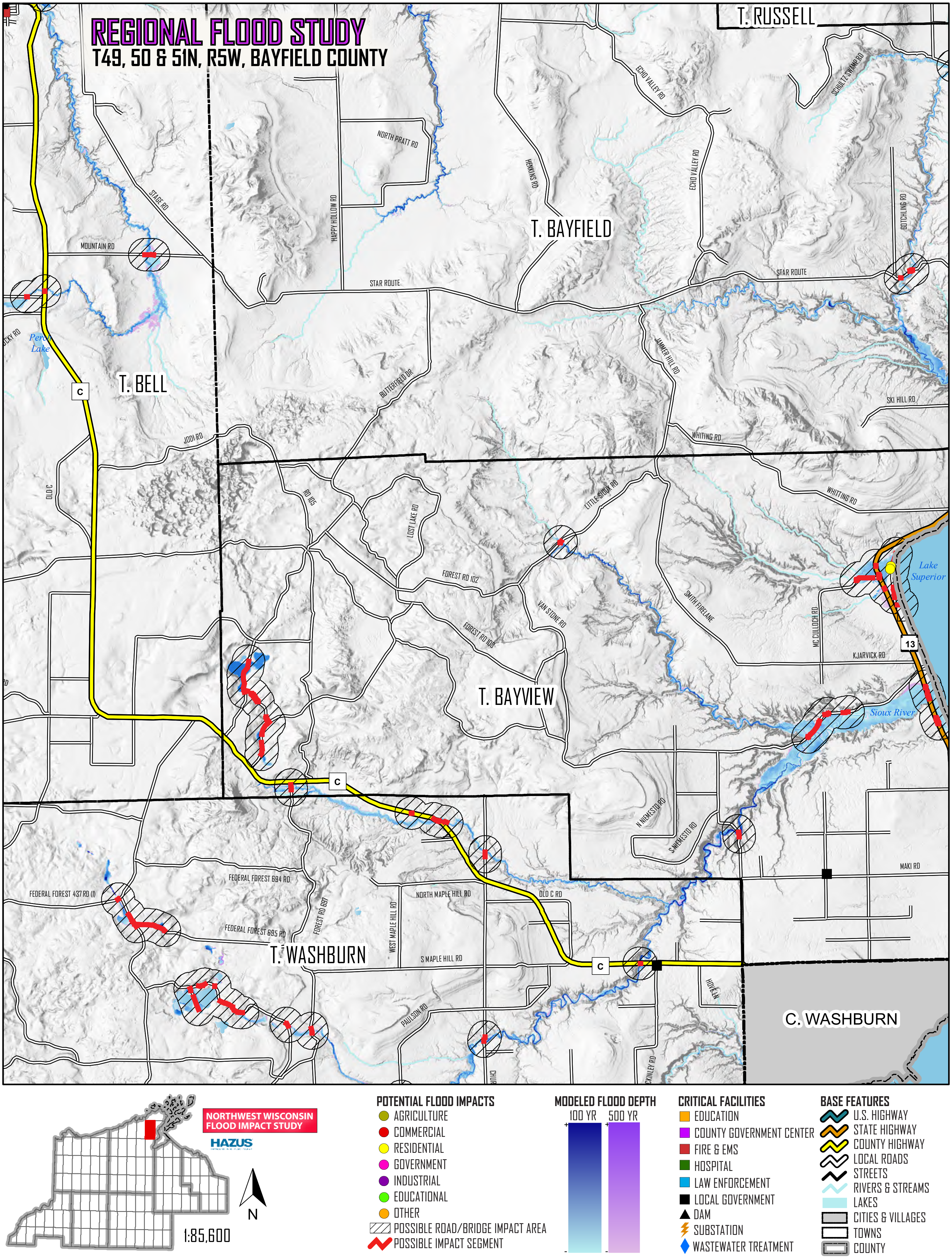
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T49, 50 & 51N, R5W, BAYFIELD COUNTY
T. RUSSELL
T. BAYFIELD
T. BELL
T. BAYVIEW
T. WASHBURN
C. WASHBURN
Perch Lake
Lake Superior
Sioux River
STAGE RD
MOUNTAIN RD
NORTH PRATT RD
HAPPY HOLLOW RD
STAR ROUTE
HENKINS RD
ECHO VALLEY RD
SCHULTZ SWAMP RD
GOTCHLING RD
JAMMER HILL RD
SKI HILL RD
WHITING RD
BUTTERFIELD DR
JODI RD
OLD C
RD 105
LOST LAKE RD
LITTLE SIOUX RD
FOREST RD 102
VAN STONE RD
FOREST RD 108
SMITH FIRELANE
MC CULLOCH RD
KJARVICK RD
N NIEMESTO RD
S NIEMESTO RD
MAKI RD
FEDERAL FOREST 437 RD (I)
FEDERAL FOREST 694 RD
FEDERAL FOREST 695 RD
FOREST RD 697
WEST MAPLE HILL RD
NORTH MAPLE HILL RD
S MAPLE HILL RD
OLD C RD
PAULSON RD
HOVE LN
C
13
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,600
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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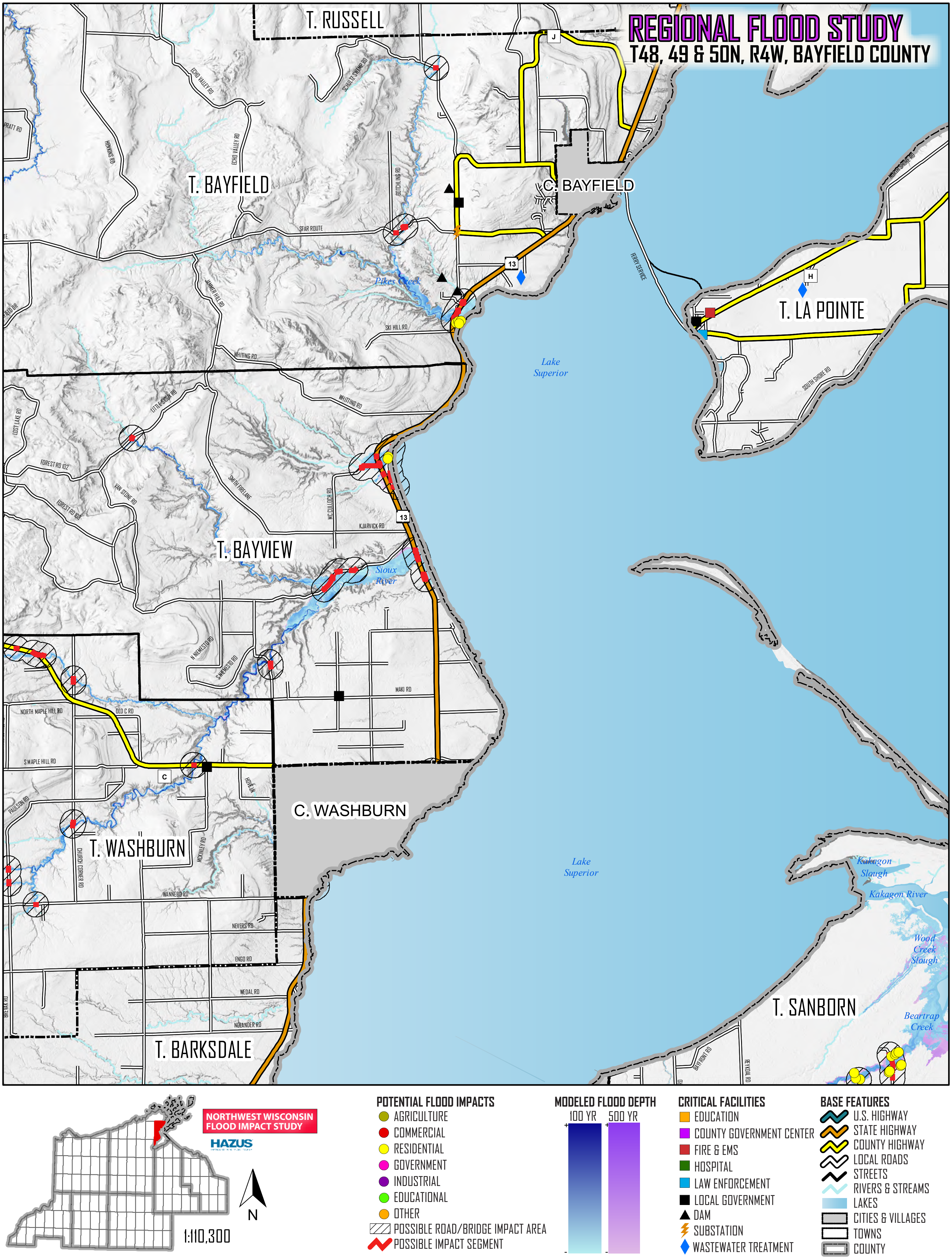
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T48, 49 & 50N, R4W, BAYFIELD COUNTY
T. RUSSELL
T. BAYFIELD
C. BAYFIELD
T. LA POINTE
T. BAYVIEW
T. WASHBURN
C. WASHBURN
T. BARKSDALE
T. SANBORN
Lake Superior
Lake Superior
Pikes Creek
Sioux River
Kakagon Slough
Kakagon River
Wood Creek Slough
Beartrap Creek
ECHO VALLEY RD
SCHULTZ SWAMP RD
HERMONS RD
PRATT RD
GOTCHAL ING RD
STAR ROUTE
JAMMER HILL RD
SKI HILL RD
WHITING RD
FERRY SERVICE
NORTH SHORE RD
SOUTH SHORE RD
LITTLE SIOUX RD
LOST LAKE RD
FOREST RD 102
VAN STONE RD
FOREST RD 104
SMITH FIRELANE
MC CULLOCH RD
KJARVICK RD
N NEMESTO RD
S NEMESTO RD
MAKI RD
NORTH MAPLE HILL RD
OLD C RD
S MAPLE HILL RD
HOVE LN
PAULSON RD
CHURCH CORNER RD
MCKINLEY RD
WANNEBO RD
NEVERS RD
ENGO RD
WEDAL RD
NOLANDER RD
BAYFRONT RD
REYKDAL RD
J
13
13
H
C
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:110,300
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
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CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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COUNTY HIGHWAY
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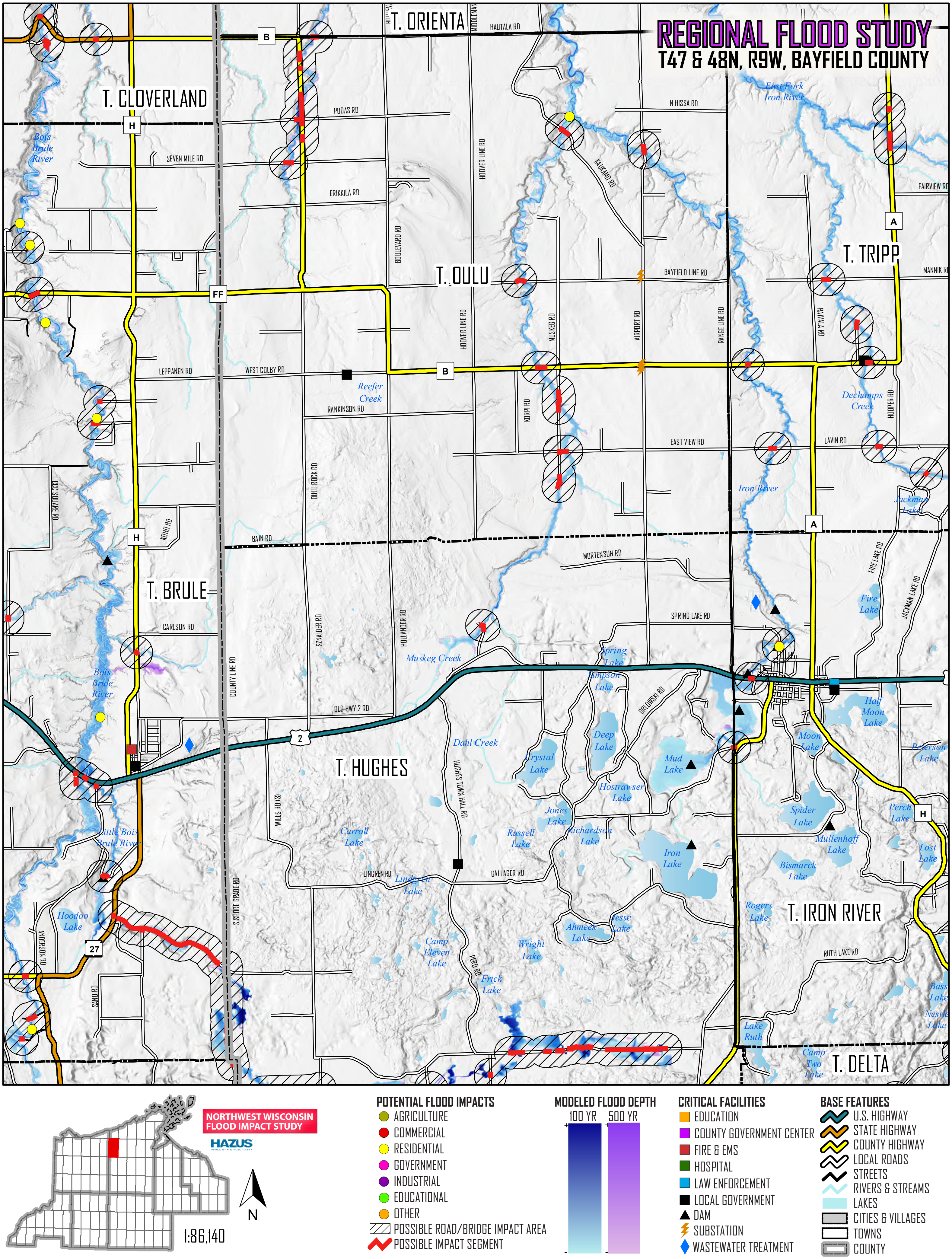
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T47 & 48N, R9W, BAYFIELD COUNTY
T. ORIENTA
T. CLOVERLAND
T. OULU
T. TRIPP
T. BRULE
T. HUGHES
T. IRON RIVER
T. DELTA
HAUTALA RD
PUDAS RD
SEVEN MILE RD
ERIKKILA RD
N HISSA RD
KAUKAMO RD
HOOVER LINE RD
FAIRVIEW RD
BOULEVARD RD
BAYFIELD LINE RD
MANNIK RD
MUSKEG RD
AIRPORT RD
RANGE LINE RD
RAIVALA RD
LEPPANEN RD
WEST COLBY RD
RANKINSON RD
KORPI RD
HOOPER RD
EAST VIEW RD
LAVIN RD
CCC SQUARE RD
OULU ROCK RD
KOHO RD
BAIN RD
MORTENSON RD
FIRE LAKE RD
JACKMAN LAKE RD
SPRING LAKE RD
CARLSON RD
COUNTY LINE RD
SZNAIDER RD
HOLLANDER RD
OLD HWY 2 RD
ORLOWSKI RD
HUGHES TOWN HALL RD
WILLS RD (3)
LINGREN RD
GALLAGER RD
S SHORE GRADE RD
ANDERSON RD
SAND RD
PERO RD
RUTH LAKE RD
Bois Brule River
Reefer Creek
East Fork Iron River
Dechamps Creek
Iron River
Jackman Lake
Fire Lake
Muskeg Creek
Spring Lake
Simpson Lake
Half Moon Lake
Moon Lake
Peterson Lake
Dahl Creek
Crystal Lake
Deep Lake
Mud Lake
Hostrawser Lake
Jones Lake
Spider Lake
Perch Lake
Carroll Lake
Russell Lake
Richardson Lake
Mullenhoff Lake
Iron Lake
Bismarck Lake
Lost Lake
Little Bois Brule River
Lindgren Lake
Hoodoo Lake
Rogers Lake
Ahmeek Lake
Jesse Lake
Camp Eleven Lake
Wright Lake
Frick Lake
Bass Lake
Nestle Lake
Lake Ruth
Camp Two Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,140
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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COUNTY HIGHWAY
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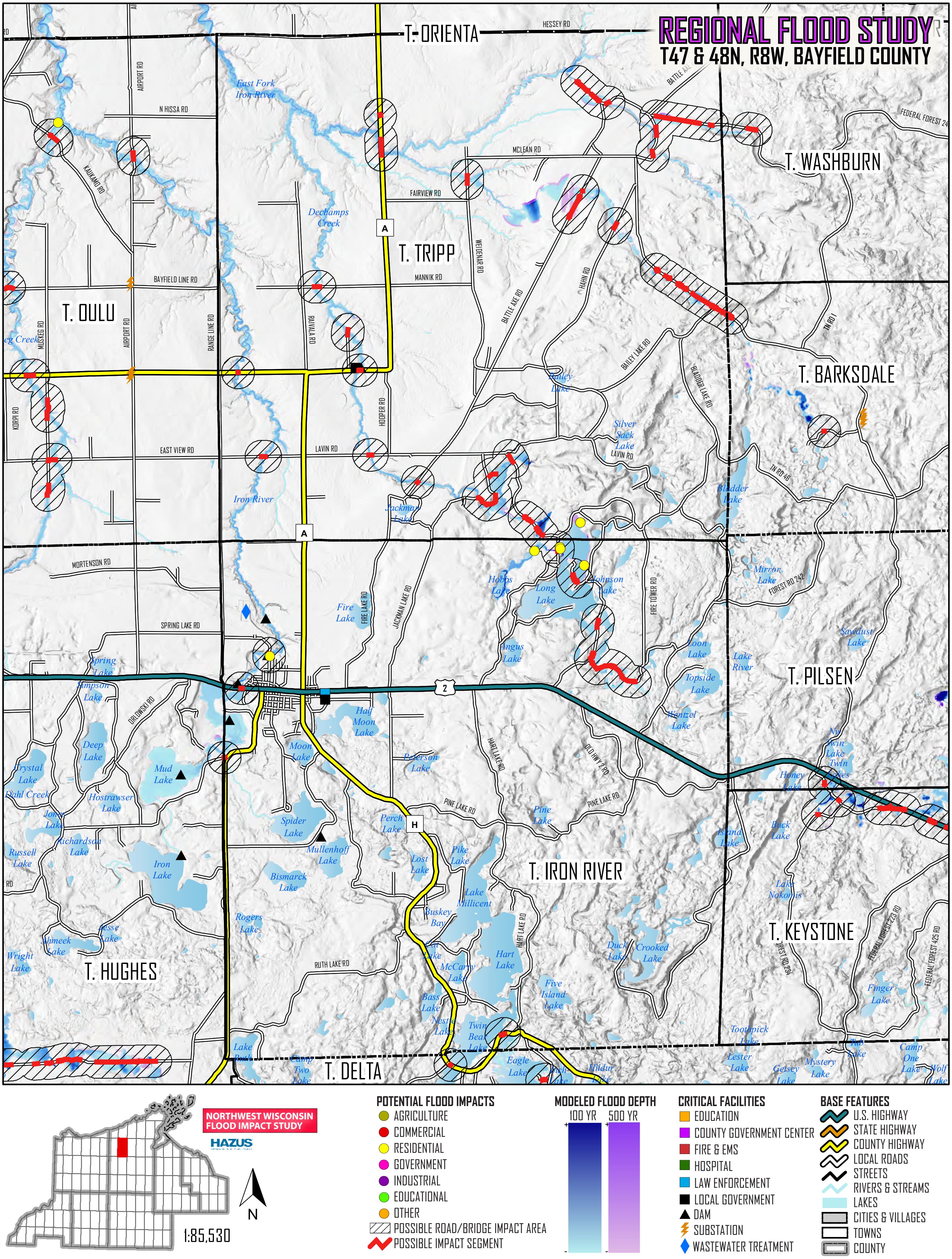
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T47 & 48N, R8W, BAYFIELD COUNTY
T. ORIENTA
T. WASHBURN
T. TRIPP
T. OULU
T. BARKSDALE
T. PILSEN
T. IRON RIVER
T. KEYSTONE
T. HUGHES
T. DELTA
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
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OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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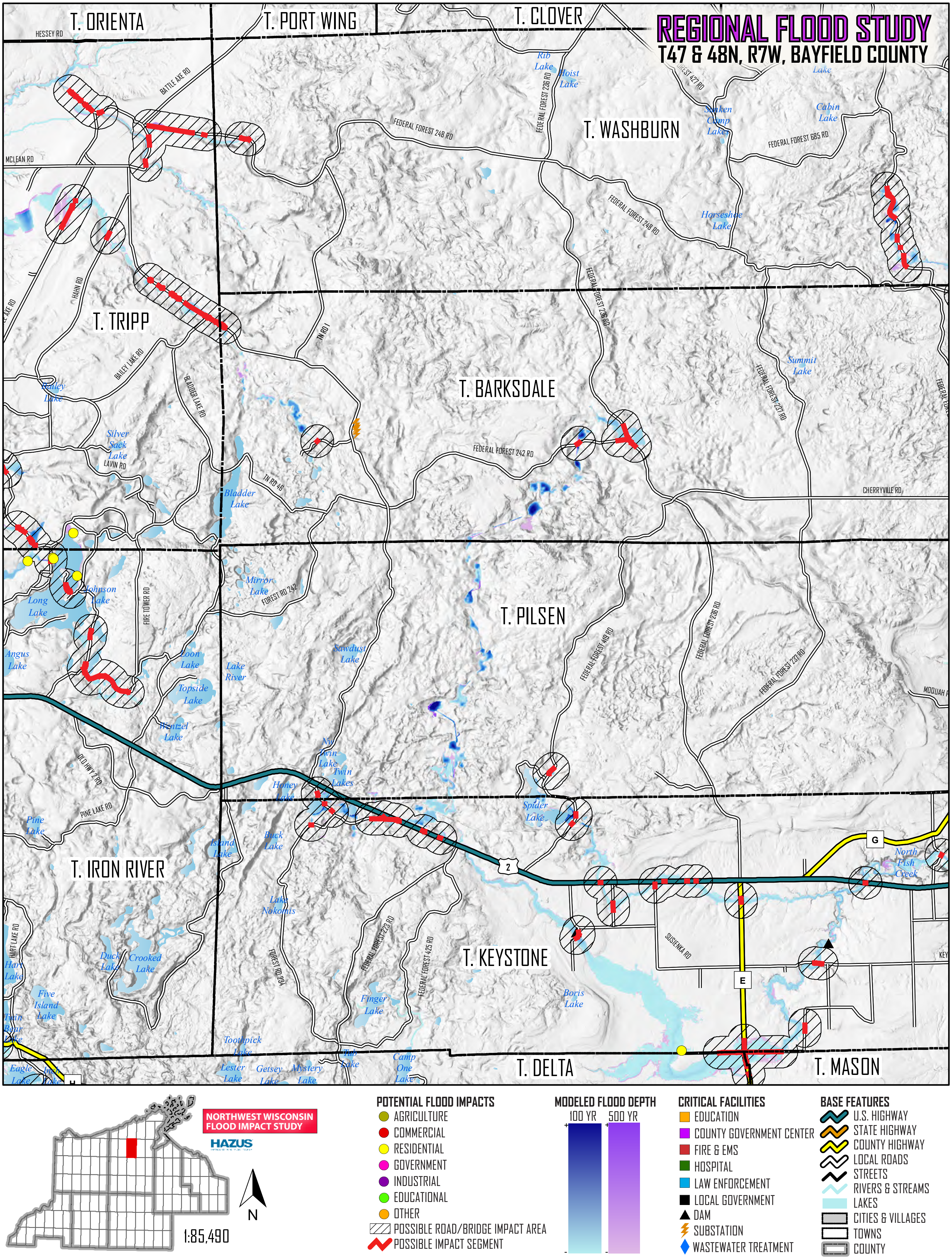
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T47 & 48N, R7W, BAYFIELD COUNTY
T. ORIENTA
T. PORT WING
T. CLOVER
T. WASHBURN
T. TRIPP
T. BARKSDALE
T. PILSEN
T. IRON RIVER
T. KEYSTONE
T. DELTA
T. MASON
HESSEY RD
BATTLE AXE RD
MCLEAN RD
HAHN RD
BAILEY LAKE RD
BLADDER LAKE RD
LAVIN RD
TN RD 1
TN RD 46
FEDERAL FOREST 248 RD
FEDERAL FOREST 236 RD
FEDERAL FOREST 685 RD
FEDERAL FOREST 242 RD
FEDERAL FOREST 237 RD
FEDERAL FOREST 449 RD
FEDERAL FOREST 223 RD
FEDERAL FOREST 425 RD
FOREST RD 242
FOREST RD 234
CHERRYVILLE RD
FIRE TOWER RD
OLD HWY 2 RD
PINE LAKE RD
HART LAKE RD
SUSIENKA RD
Rib Lake
Hoist Lake
Sunken Camp Lakes
Cabin Lake
Horseshoe Lake
Summit Lake
Bailey Lake
Silver Sack Lake
Bladder Lake
Mirror Lake
Johnson Lake
Long Lake
Angus Lake
Loon Lake
Lake River
Topside Lake
Sawdust Lake
Wentzel Lake
Twin Lakes
Honey Lake
Spider Lake
Pine Lake
Island Lake
Buck Lake
North Fish Creek
Lake Nokomis
Duck Lake
Crooked Lake
Hart Lake
Five Island Lake
Finger Lake
Boris Lake
Toothpick Lake
Lester Lake
Getsey Lake
Mystery Lake
Camp One Lake
Eagle Lake
2
G
E
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
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GOVERNMENT
INDUSTRIAL
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OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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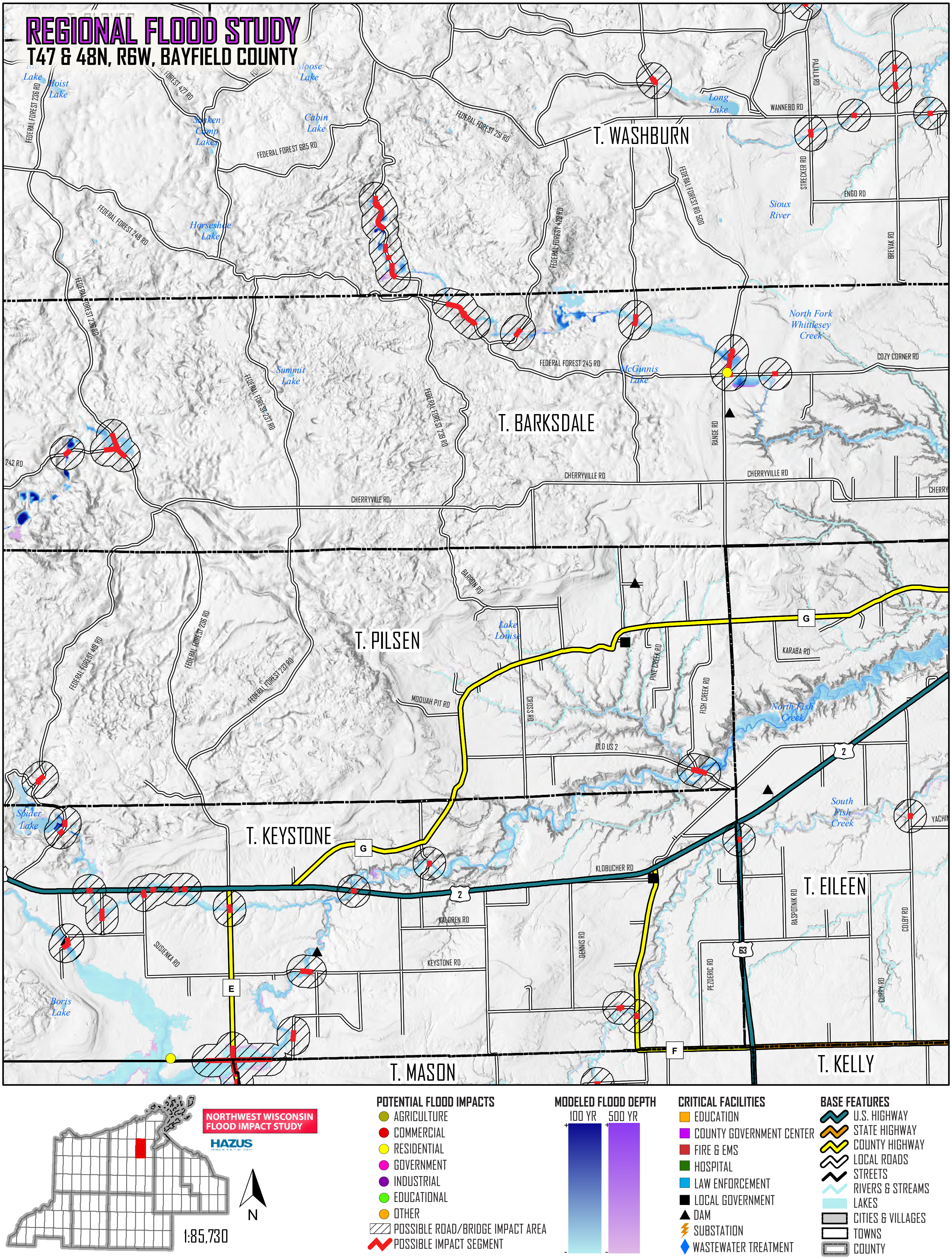
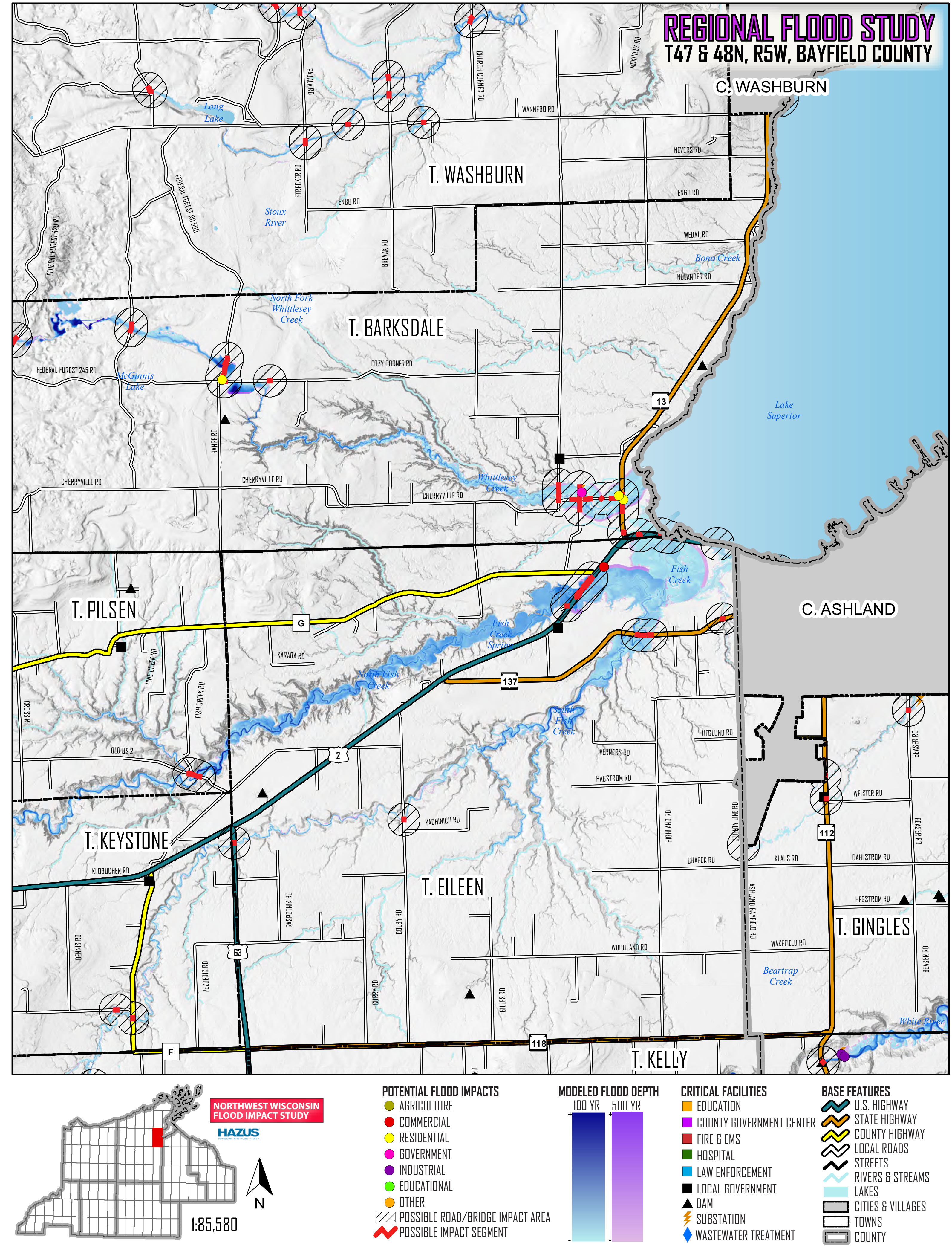
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T47 & 48N, R6W, BAYFIELD COUNTY
T. WASHBURN
T. BARKSDALE
T. PILSEN
T. KEYSTONE
T. EILEEN
T. MASON
T. KELLY
Hoist Lake
Moose Lake
Cabin Lake
Sunken Camp Lakes
Horseshoe Lake
Long Lake
Sioux River
North Fork Whittlesey Creek
Summit Lake
McGinnis Lake
Lake Louise
North Fish Creek
South Fish Creek
Spider Lake
Boris Lake
FEDERAL FOREST 236 RD
FEDERAL FOREST 427 RD
FEDERAL FOREST 685 RD
FEDERAL FOREST 251 RD
FEDERAL FOREST 248 RD
FEDERAL FOREST 429 RD
FEDERAL FOREST RD 500
FEDERAL FOREST 245 RD
FEDERAL FOREST 237 RD
FEDERAL FOREST 239 RD
FEDERAL FOREST 419 RD
FEDERAL FOREST 236 RD
WANNEBO RD
PAJALA RD
STRECKER RD
ENGO RD
BREVAK RD
COZY CORNER RD
RANGE RD
CHERRYVILLE RD
242 RD
BARRON RD
KARABA RD
PINE CREEK RD
FISH CREEK RD
CROSS RD
MOQUAH PIT RD
OLD US 2
KLOBUCHER RD
KALGREN RD
KEYSTONE RD
SUSENKA RD
DENNIS RD
PEZDERIC RD
RASPOTNIK RD
COLBY RD
CURRY RD
YACHIN
G
E
F
2
63
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,730



REGIONAL FLOOD STUDY
T47 & 48N, R5W, BAYFIELD COUNTY
C. WASHBURN
T. WASHBURN
T. BARKSDALE
T. PILSEN
T. KEYSTONE
T. EILEEN
T. GINGLES
T. KELLY
C. ASHLAND
Long Lake
Sioux River
North Fork Whittlesey Creek
McGinnis Lake
Whittlesey Creek
Bono Creek
Lake Superior
Fish Creek
Fish Creek Spring
North Fish Creek
South Fish Creek
Beartrap Creek
White River
PAJALA RD
CHURCH CORNER RD
MCKINLEY RD
WANNEBO RD
NEVERS RD
ENGO RD
STRECKER RD
FEDERAL FOREST RD 500
FEDERAL FOREST 429 RD
BREVAK RD
WEDAL RD
NOLANDER RD
FEDERAL FOREST 245 RD
COZY CORNER RD
RANGE RD
CHERRYVILLE RD
KARABA RD
PINE CREEK RD
FISH CREEK RD
CROSS RD
OLD US 2
HEGLUND RD
VERNERS RD
HAGSTROM RD
YACHINICH RD
HIGHLAND RD
COUNTY LINE RD
CHAPEK RD
KLAUS RD
WEISTER RD
DAHLSTROM RD
BEASER RD
KLOBUCHER RD
RASPOTNIK RD
COLBY RD
HEGSTROM RD
ASHLAND BAYFIELD RD
WAKEFIELD RD
DENNIS RD
PEZDERIC RD
CURRY RD
GILLES RD
WOODLAND RD
13
G
137
2
112
63
118
F
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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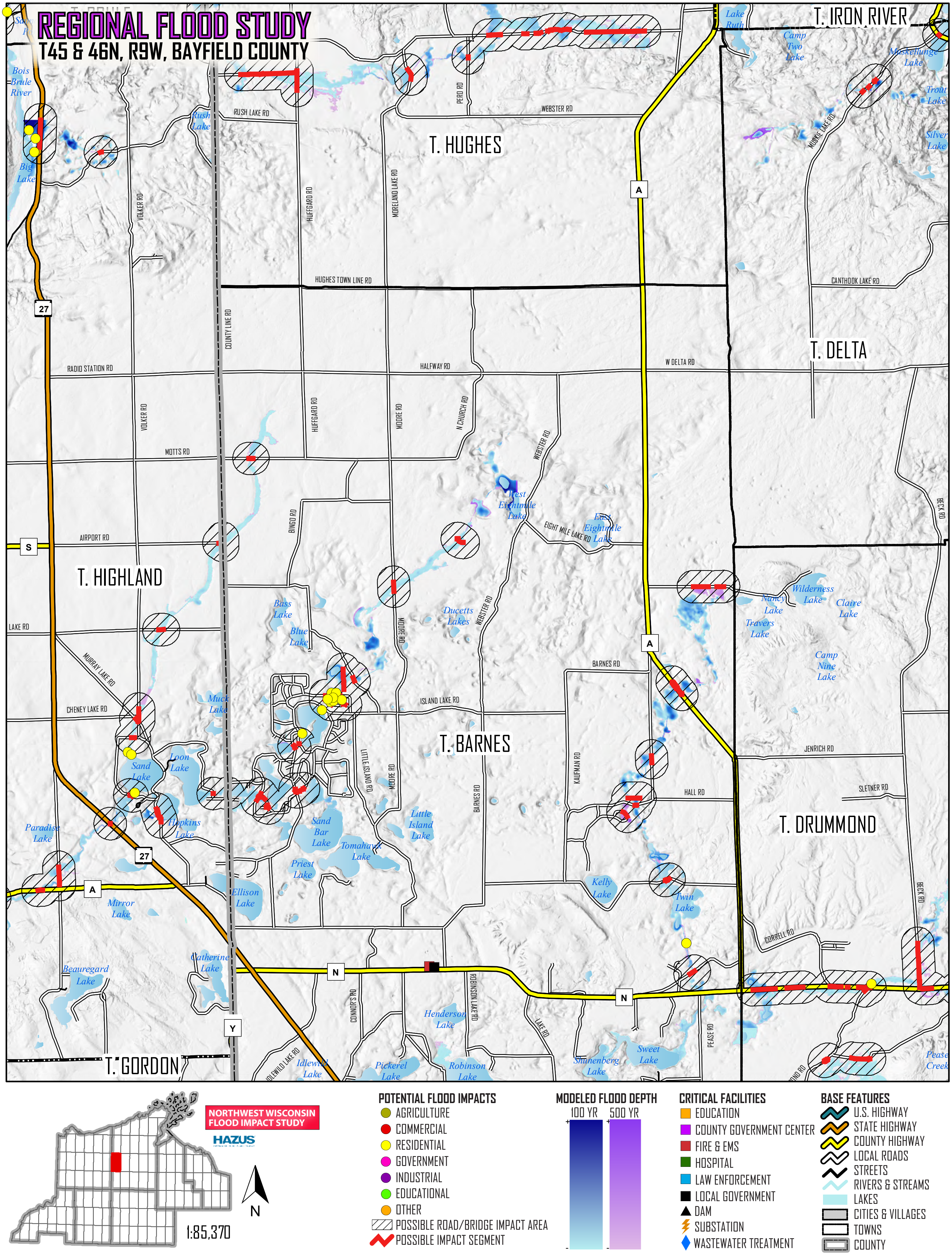
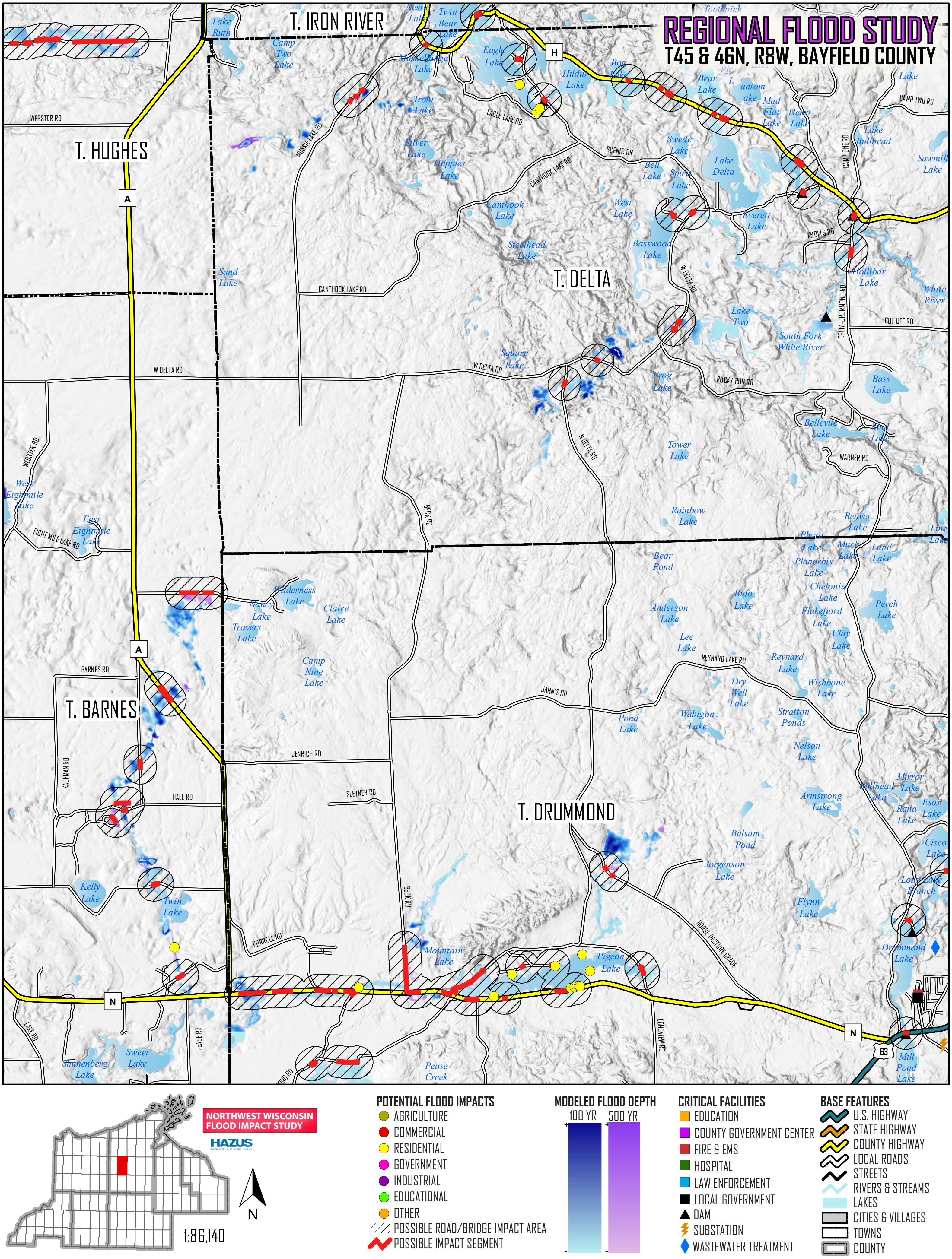

REGIONAL FLOOD STUDY
T45 & 46N, R9W, BAYFIELD COUNTY
T. IRON RIVER
T. HUGHES
T. DELTA
T. HIGHLAND
T. BARNES
T. DRUMMOND
T. GORDON
Bois Brule River
Big Lake
Rush Lake
Lake Ruth
Camp Two Lake
Muskellunge Lake
Trout Lake
Silver Lake
RUSH LAKE RD
WEBSTER RD
PERO RD
MUSKIE LAKE RD
VOLKER RD
HUFFGARD RD
MORELAND LAKE RD
HUGHES TOWN LINE RD
CANTHOOK LAKE RD
COUNTY LINE RD
RADIO STATION RD
HALFWAY RD
W DELTA RD
N CHURCH RD
MOORE RD
MOTTS RD
West Eightmile Lake
East Eightmile Lake
EIGHT MILE LAKE RD
BINGO RD
AIRPORT RD
BECK RD
LAKE RD
MURRAY LAKE RD
Bass Lake
Blue Lake
Ducetts Lakes
Wilderness Lake
Nancy Lake
Claire Lake
Travers Lake
Camp Nine Lake
BARNES RD
CHENEY LAKE RD
ISLAND LAKE RD
Muck Lake
Sand Lake
Loon Lake
Hopkins Lake
Paradise Lake
LITTLE ISLAND RD
KAUFMAN RD
JENRICH RD
HALL RD
SLETNER RD
Little Island Lake
Sand Bar Lake
Tomahawk Lake
Priest Lake
Ellison Lake
Mirror Lake
Kelly Lake
Twin Lake
CORRELL RD
Beauregard Lake
Catherine Lake
ROBINSON LAKE RD
CONNOR'S RD
LAKE RD
Henderson Lake
Sweet Lake
Shunenberg Lake
PEASE RD
IDLEWILD LAKE RD
Idlewild Lake
Pickerel Lake
Robinson Lake
Pease Creek
27
S
A
N
Y
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,370
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T45 & 46N, R8W, BAYFIELD COUNTY
T. IRON RIVER
T. HUGHES
T. DELTA
T. BARNES
T. DRUMMOND
Lake Ruth
Camp Two Lake
Twin Bear Lake
Muskellunge Lake
Eagle Lake
Hildur Lake
Bog Lake
Bear Lake
Mud Flat Lake
Heart Lake
Trout Lake
Silver Lake
Happles Lake
Swede Lake
Bell Lake
Spirit Lake
Lake Delta
Bullhead Lake
Sawmill Lake
Canthook Lake
West Lake
Everett Lake
Steelhead Lake
Basswood Lake
Hollibar Lake
White River
Sand Lake
Lake Two
South Fork White River
Square Lake
Frog Lake
Bass Lake
Bellevue Lake
Tower Lake
Rainbow Lake
Beaver Lake
West Eightmile Lake
East Eightmile Lake
Bear Pond
Wilderness Lake
Nancy Lake
Claire Lake
Travers Lake
Anderson Lake
Bufo Lake
Perch Lake
Lee Lake
Clay Lake
Camp Nine Lake
Reynard Lake
Dry Well Lake
Wishbone Lake
Pond Lake
Wabigon Lake
Stratton Ponds
Nelson Lake
Mirror Lake
Armstrong Lake
Balsam Pond
Jorgenson Lake
Cisco Lake
Flynn Lake
Kelly Lake
Twin Lake
Mountain Lake
Pigeon Lake
Drummond Lake
Sweet Lake
Pease Creek
Mill Pond Lake
WEBSTER RD
MUSKIE LAKE RD
EAGLE LAKE RD
SCENIC DR
CANTHOOK LAKE RD
CAMP TWO RD
CAMP ONE RD
KNOLLS RD
W DELTA RD
CUT OFF RD
DELTA-DRUMMOND RD
ROCKY RUN RD
N DELTA RD
WARNER RD
BECK RD
EIGHT MILE LAKE RD
BARNES RD
JAHN'S RD
REYNARD LAKE RD
JENRICH RD
SLETNER RD
KAUFMAN RD
HALL RD
CORRELL RD
HORSE PASTURE GRADE
LONGVIEW RD
LAKE RD
PEASE RD
A
H
N
63
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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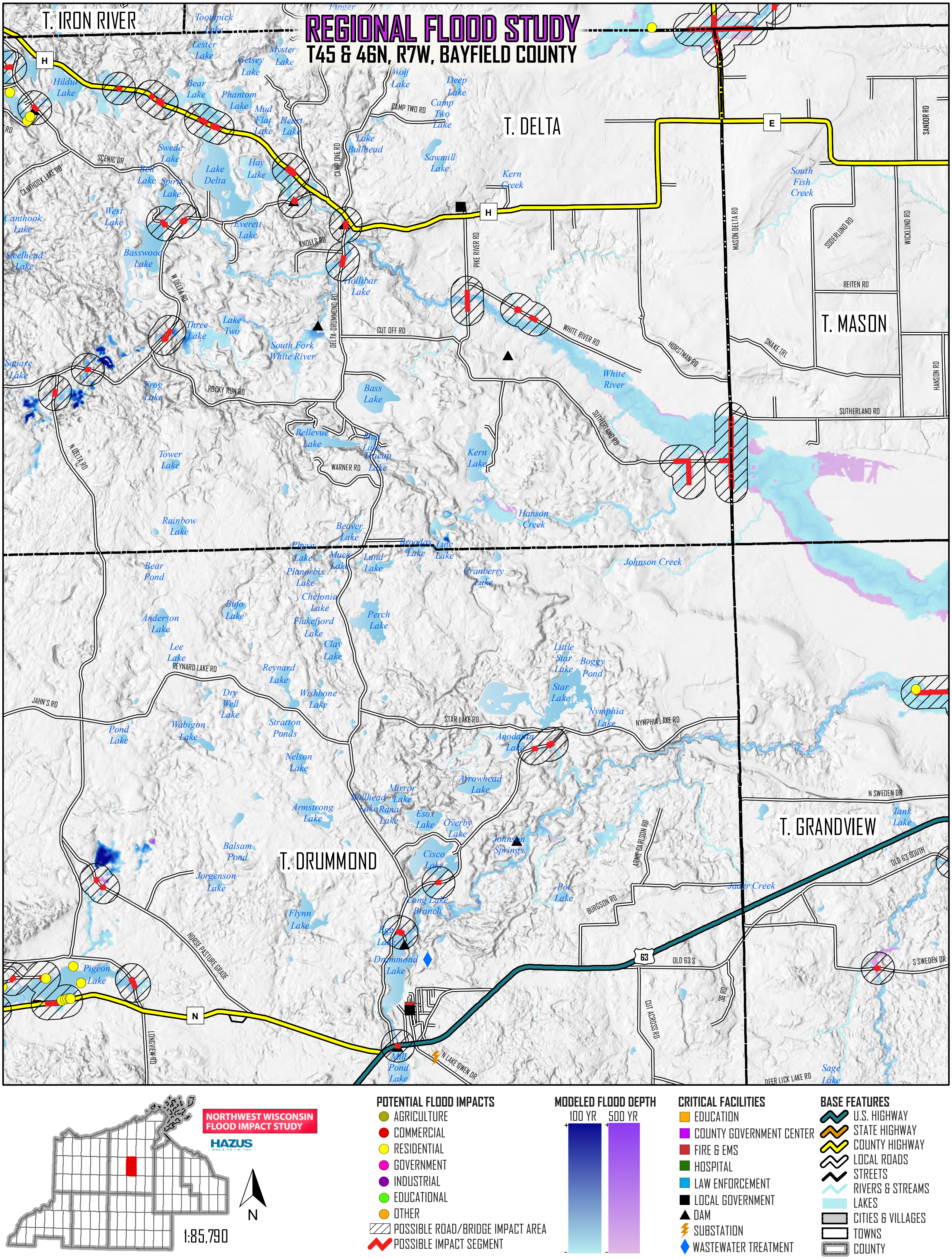

REGIONAL FLOOD STUDY
T45 & 46N, R7W, BAYFIELD COUNTY
T. IRON RIVER
T. DELTA
T. MASON
T. DRUMMOND
T. GRANDVIEW
White River
South Fork White River
Hanson Creek
Johnson Creek
Kern Creek
South Fish Creek
Long Lake Branch
Jader Creek
Lake Delta
Bass Lake
Kern Lake
Perch Lake
Star Lake
Drummond Lake
Cisco Lake
Pigeon Lake
Mill Pond Lake
CAMP ONE RD
DELTA-DRUMMOND RD
PIKE RIVER RD
MASON DELTA RD
WHITE RIVER RD
SUTHERLAND RD
STAR LAKE RD
NYMPHIA LAKE RD
REYNARD LAKE RD
HORSE PASTURE GRADE
OLD 63 S
N LAKE OWEN DR
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
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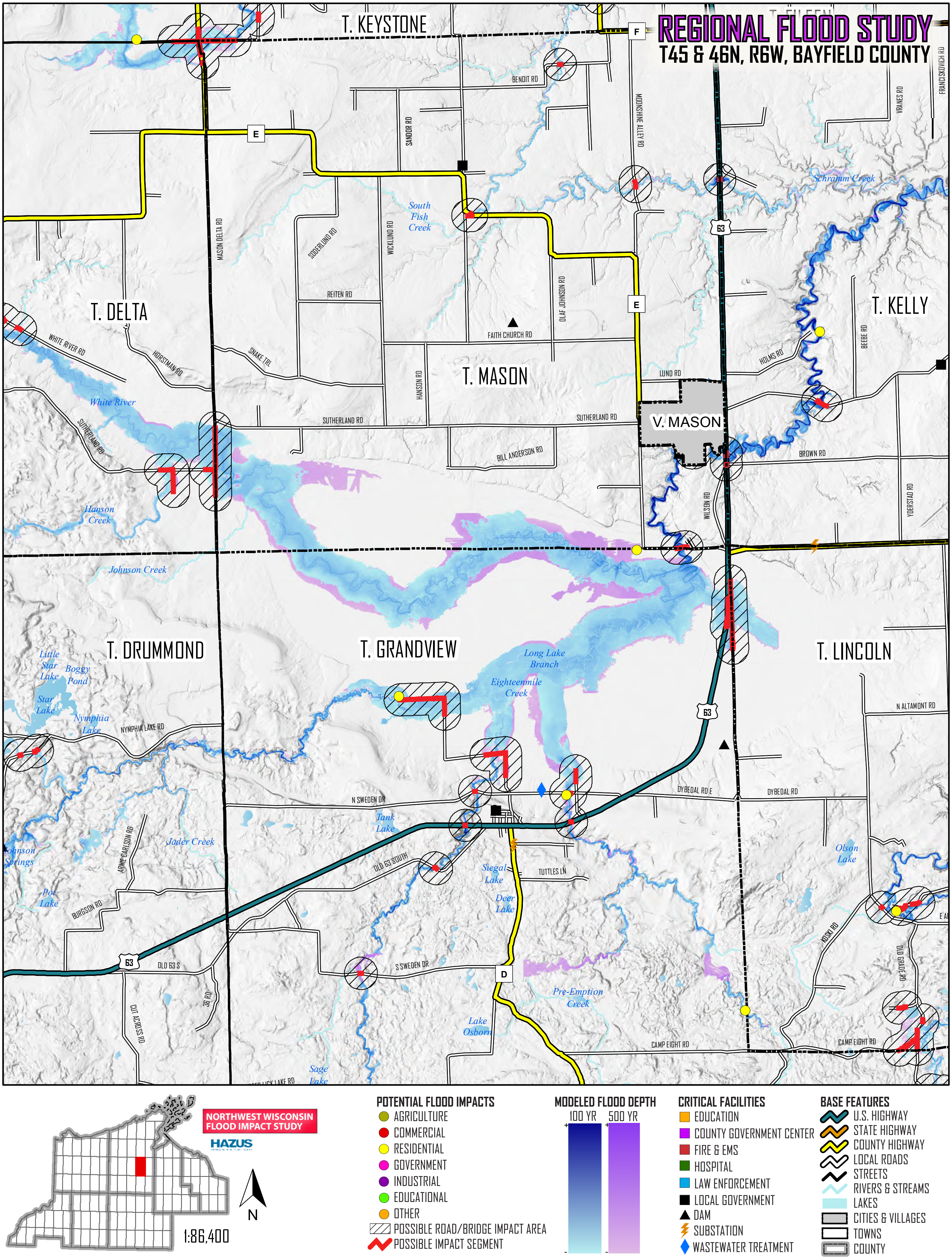
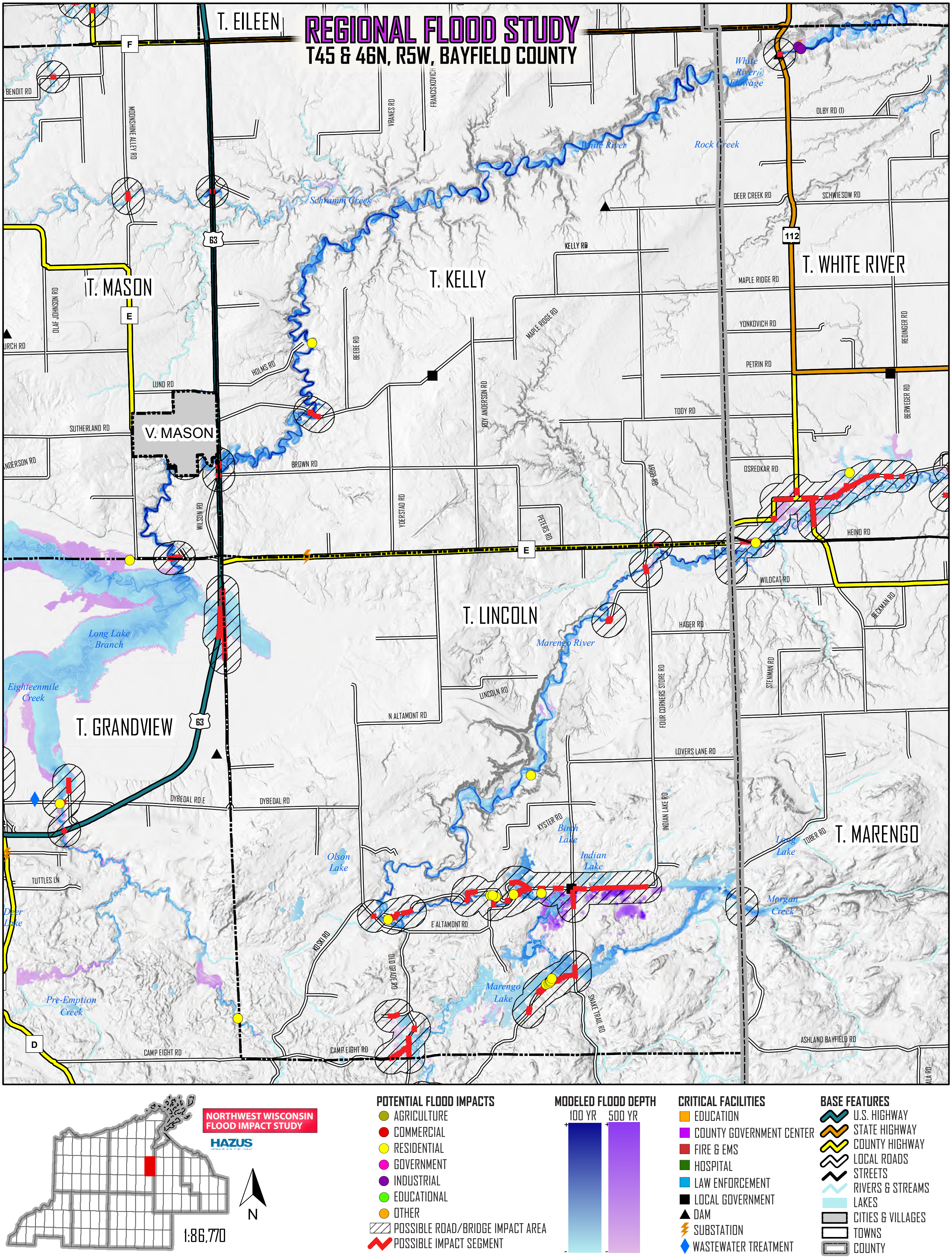


REGIONAL FLOOD STUDY
T45 & 46N, R6W, BAYFIELD COUNTY
T. KEYSTONE
T. DELTA
T. MASON
V. MASON
T. KELLY
T. DRUMMOND
T. GRANDVIEW
T. LINCOLN
White River
Hanson Creek
Johnson Creek
South Fish Creek
Schramm Creek
Long Lake Branch
Eighteenmile Creek
Little Star Lake
Boggy Pond
Star Lake
Nymphia Lake
Jader Creek
Johnson Springs
Pot Lake
Tank Lake
Siegal Lake
Deer Lake
Olson Lake
Pre-Emption Creek
Lake Osborn
Sage Lake
BENOIT RD
SANDOR RD
MOONSHINE ALLEY RD
MASON DELTA RD
SIDERLUND RD
WICKLUND RD
REITEN RD
OLAF JOHNSON RD
FAITH CHURCH RD
WHITE RIVER RD
HORSTMAN RD
SNAKE TRL
HANSON RD
LUND RD
HOLMS RD
BEEBE RD
VRANES RD
FRANCISKOVICH RD
SUTHERLAND RD
BILL ANDERSON RD
BROWN RD
WILSON RD
YOERSTAD RD
N ALTAMONT RD
NYMPHIA LAKE RD
N SWEDEN DR
DYBEDAL RD E
DYBEDAL RD
ARNIE CARLSON RD
OLD 63 SOUTH
TUTTLES LN
BURGSON RD
OLD 63 S
S SWEDEN DR
KOSKI RD
OLD GRADE RD
CUT ACROSS RD
35 RD
CAMP EIGHT RD
63
E
F
D
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,400
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T45 & 46N, R5W, BAYFIELD COUNTY
T. EILEEN
T. MASON
V. MASON
T. KELLY
T. WHITE RIVER
T. LINCOLN
T. GRANDVIEW
T. MARENGO
White River Flowage
White River
Rock Creek
Schramm Creek
Long Lake Branch
Eighteenmile Creek
Marengo River
Birch Lake
Indian Lake
Olson Lake
Long Lake
Morgan Creek
Deer Lake
Marengo Lake
Pre-Emption Creek
BENOIT RD
MOONSHINE ALLEY RD
VRANES RD
FRANCISKOVICH
OLBY RD (I)
DEER CREEK RD
SCHWIESOW RD
KELLY RD
MAPLE RIDGE RD
YONKOVICH RD
REDINGER RD
PETRIN RD
BERWEGER RD
OLAF JOHNSON RD
LUND RD
HOLMS RD
BEEBE RD
ROY ANDERSON RD
SUTHERLAND RD
ANDERSON RD
BROWN RD
TODY RD
ARGO RD
OSREDKAR RD
HEINO RD
WILSON RD
YOERSTAD RD
PETERS RD
WILDCAT RD
BECKMAN RD
HAGER RD
LINCOLN RD
N ALTAMONT RD
FOUR CORNERS STORE RD
STENMAN RD
LOVERS LANE RD
DYBEDAL RD E
DYBEDAL RD
KYSTER RD
INDIAN LAKE RD
TOBER RD
TUTTLES LN
E ALTAMONT RD
KOSKI RD
OLD GRADE RD
SNAKE TRAIL RD
CAMP EIGHT RD
ASHLAND BAYFIELD RD
63
112
E
F
D
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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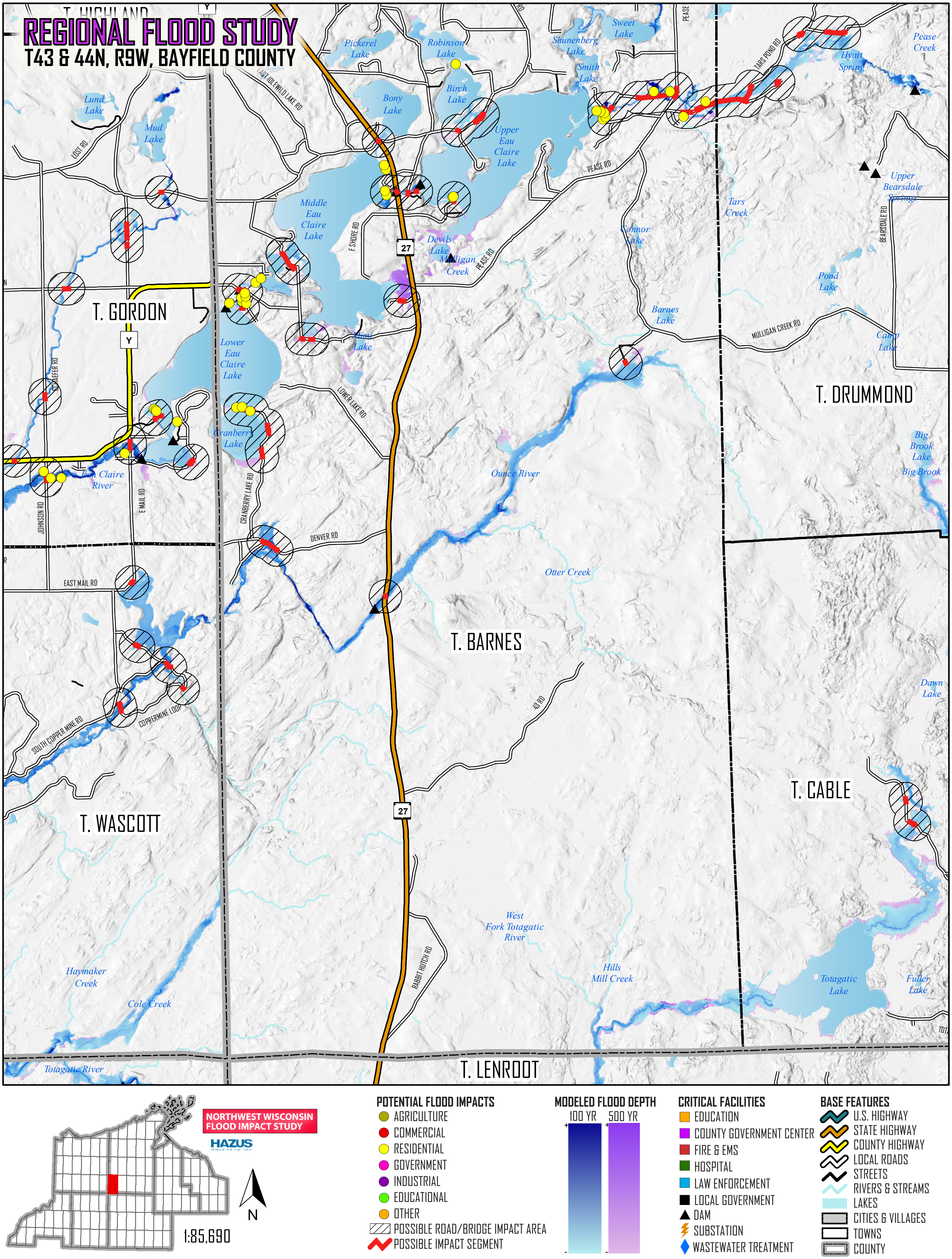
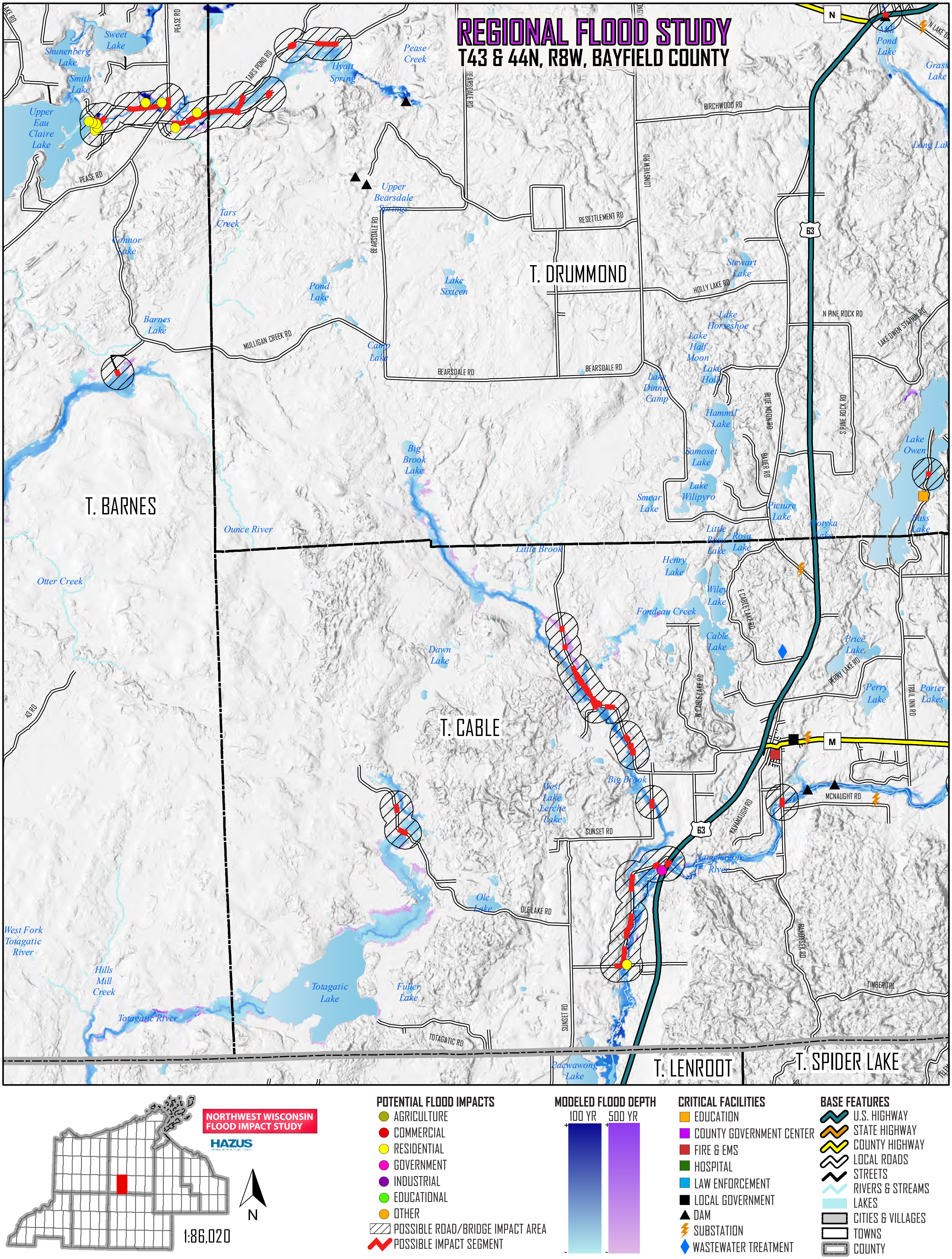


REGIONAL FLOOD STUDY
T43 & 44N, R9W, BAYFIELD COUNTY
T. HIGHLAND
T. GORDON
T. DRUMMOND
T. BARNES
T. CABLE
T. WASCOTT
T. LENROOT
Pickerel Lake
Robinson Lake
Sweet Lake
Shunenberg Lake
Smith Lake
Pease Creek
Hyatt Spring
Lund Lake
Mud Lake
Bony Lake
Birch Lake
Upper Eau Claire Lake
Middle Eau Claire Lake
Lower Eau Claire Lake
Devils Lake
Milligan Creek
Tars Creek
Connor Lake
Upper Bearsdale Springs
Pond Lake
Barnes Lake
Camp Lake
Cranberry Lake
Eau Claire River
Ounce River
Big Brook Lake
Big Brook
Otter Creek
Dawn Lake
West Fork Totagatic River
Hills Mill Creek
Totagatic Lake
Fuller Lake
Haymaker Creek
Cole Creek
Totagatic River
LOST RD
EAST IDLEWILD LAKE RD
TARS POND RD
PEASE RD
E SHORE RD
BEARSDALE RD
MULLIGAN CREEK RD
SCHAEFER RD
LOWER LAKE RD
JOHNSON RD
E MAIL RD
CRANBERRY LAKE RD
DENVER RD
EAST MAIL RD
SOUTH COPPER MINE RD
COPPERMINE LOOP
43 RD
RABBIT HUTCH RD
27
Y
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,690
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T43 & 44N, R8W, BAYFIELD COUNTY
T. DRUMMOND
T. BARNES
T. CABLE
T. LENROOT
T. SPIDER LAKE
Upper Eau Claire Lake
Shunenberg Lake
Sweet Lake
Smith Lake
Pease Creek
Hyatt Spring
Upper Beardsale Springs
Tars Creek
Connor Lake
Barnes Lake
Pond Lake
Camp Lake
Lake Sixteen
Stewart Lake
Lake Horseshoe
Lake Half Moon
Lake Holly
Lake Dinner Camp
Hammil Lake
Samoset Lake
Lake Wilipyro
Smear Lake
Picture Lake
Lake Owen
Bass Lake
Rosa Lake
Henry Lake
Wiley Lake
Fondeau Creek
Cable Lake
Price Lake
Perry Lake
Porter Lakes
Mill Pond Lake
Grass Lake
Big Brook Lake
Ounce River
Little Brook
Otter Creek
Dawn Lake
West Lake
Lerche Lake
Big Brook
Namekagon River
Ole Lake
Fuller Lake
Totagatic Lake
Totagatic River
West Fork Totagatic River
Hills Mill Creek
Pacwawong Lake
PEASE RD
TARS POND RD
BEARSDALE RD
BIRCHWOOD RD
LONGVIEW RD
RESETTLEMENT RD
HOLLY LAKE RD
N PINE ROCK RD
LAKE OWEN STATION RD
S PINE ROCK RD
BLUE MOON RD
BAUER RD
MULLIGAN CREEK RD
E CABLE LAKE RD
W CABLE LAKE RD
PERRY LAKE RD
TRAIL INN RD
MCNAUGHT RD
KAVANAUGH RD
SUNSET RD
OLE LAKE RD
TOTAGATIC RD
TIMBER TRL
43 RD
63
M
N
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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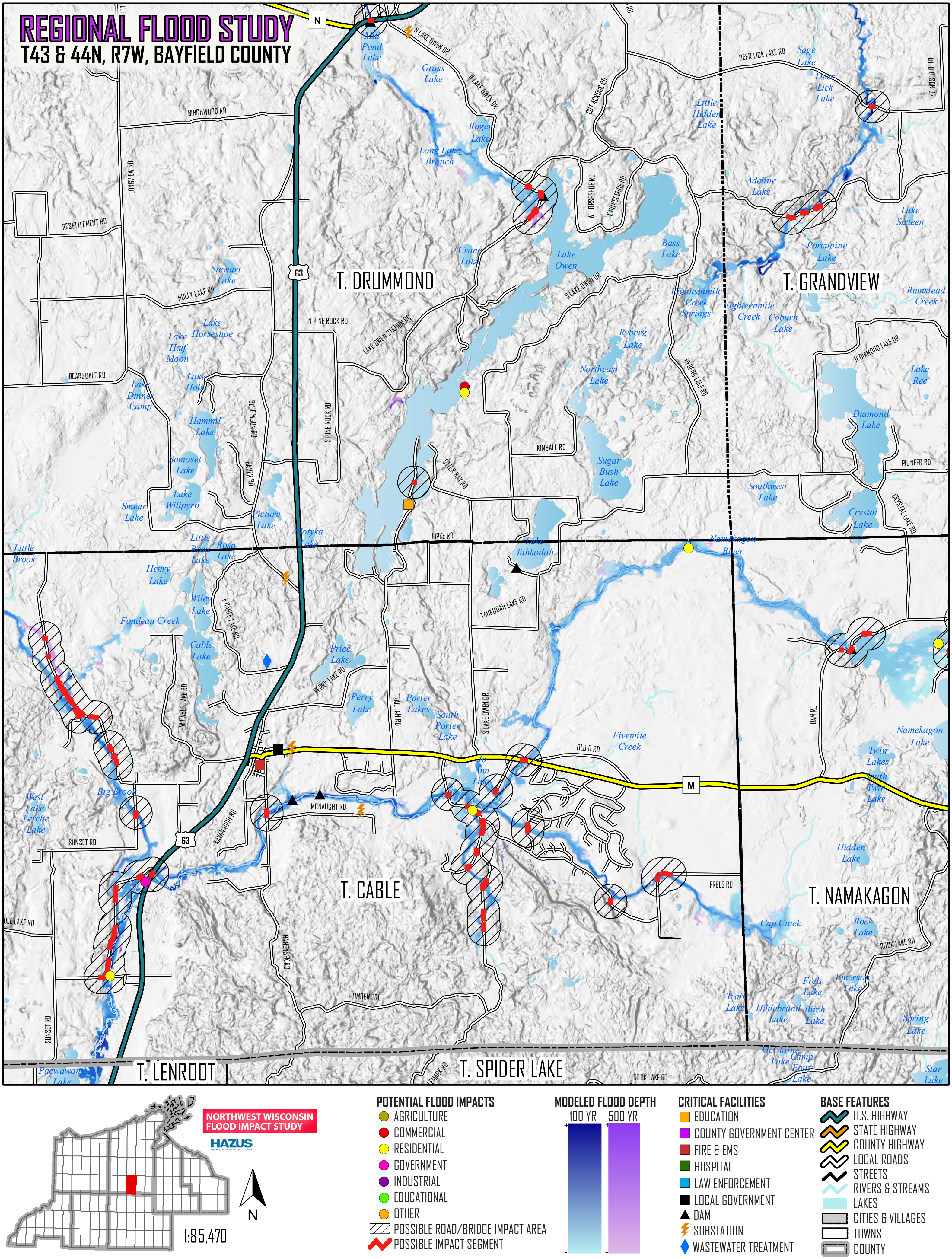
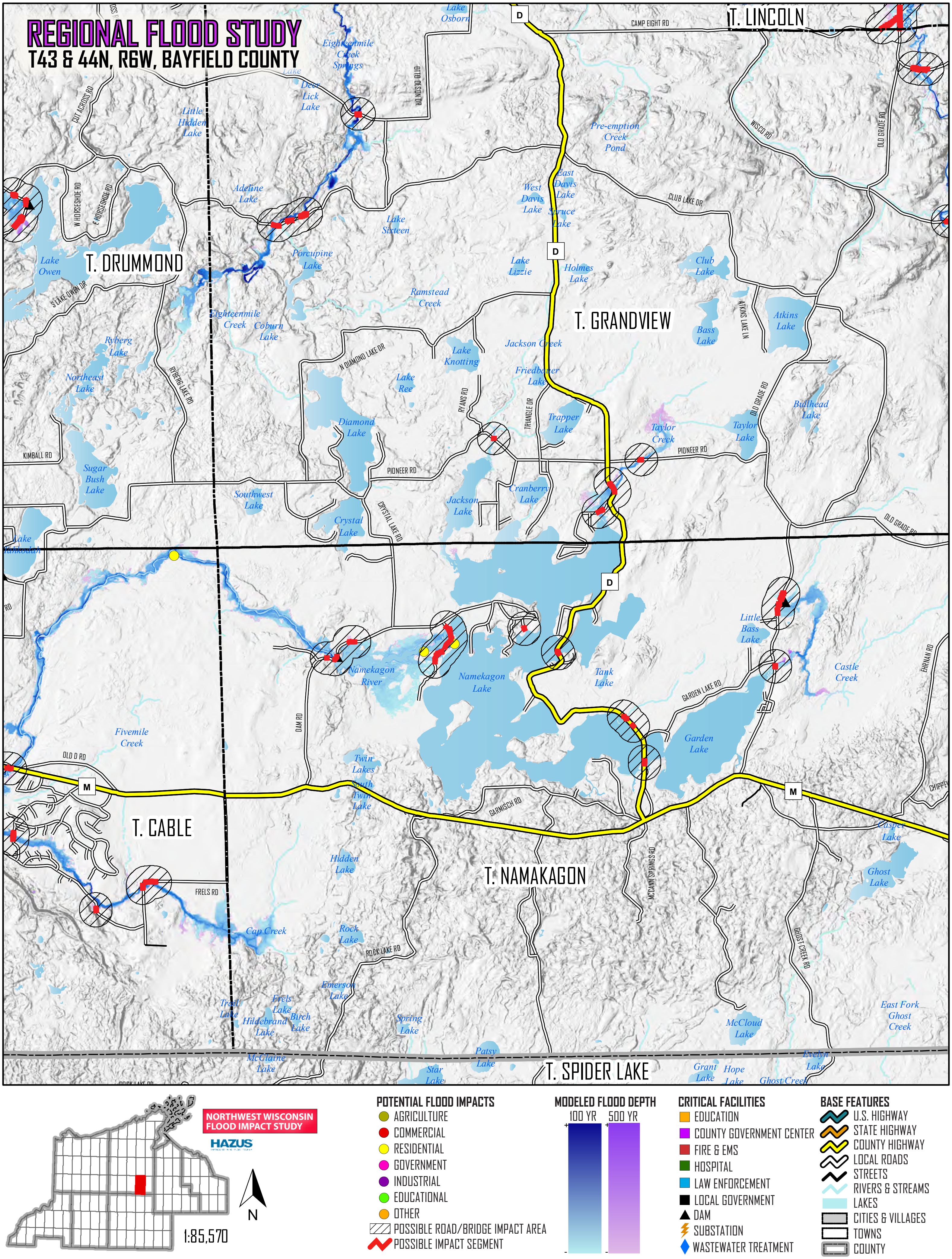
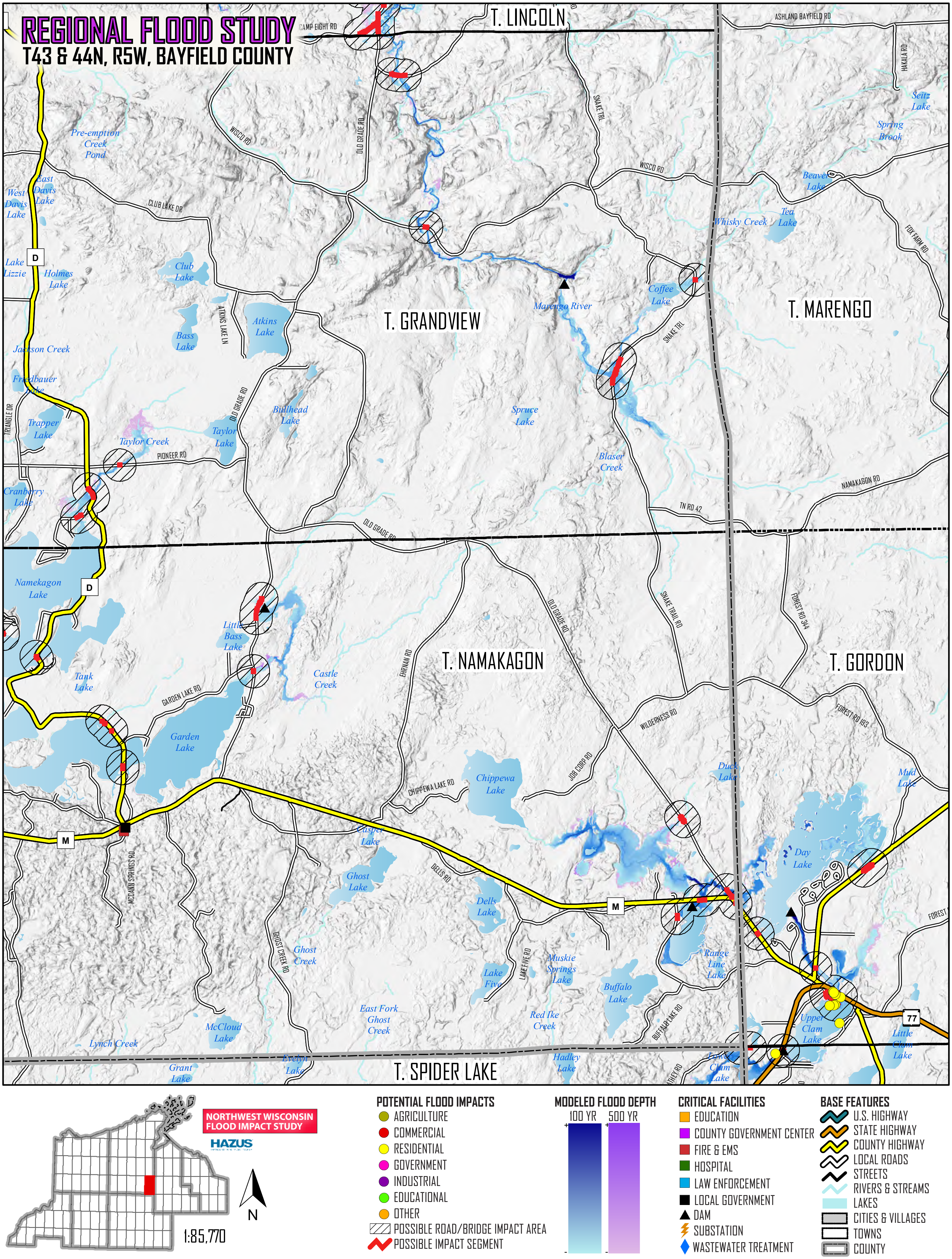
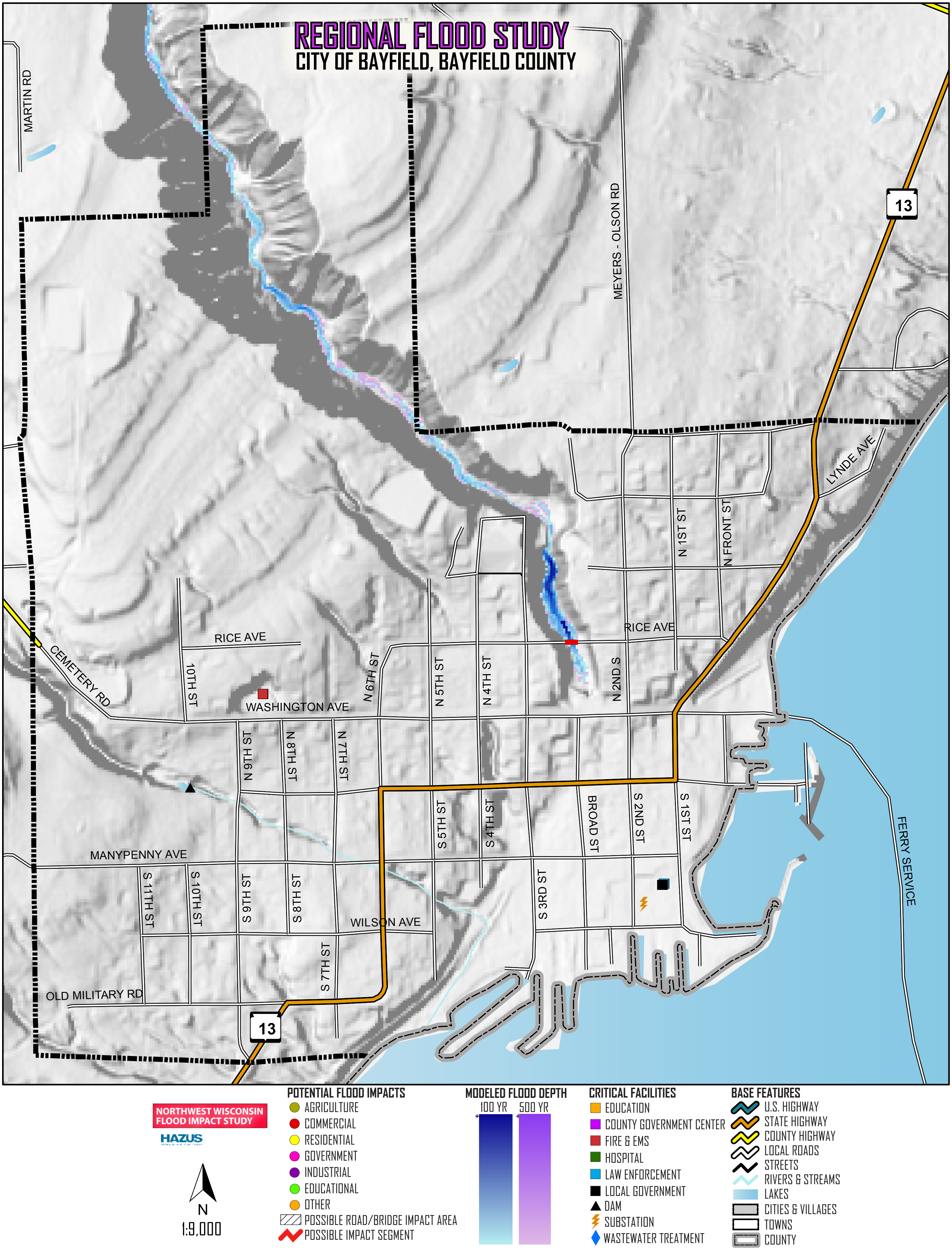
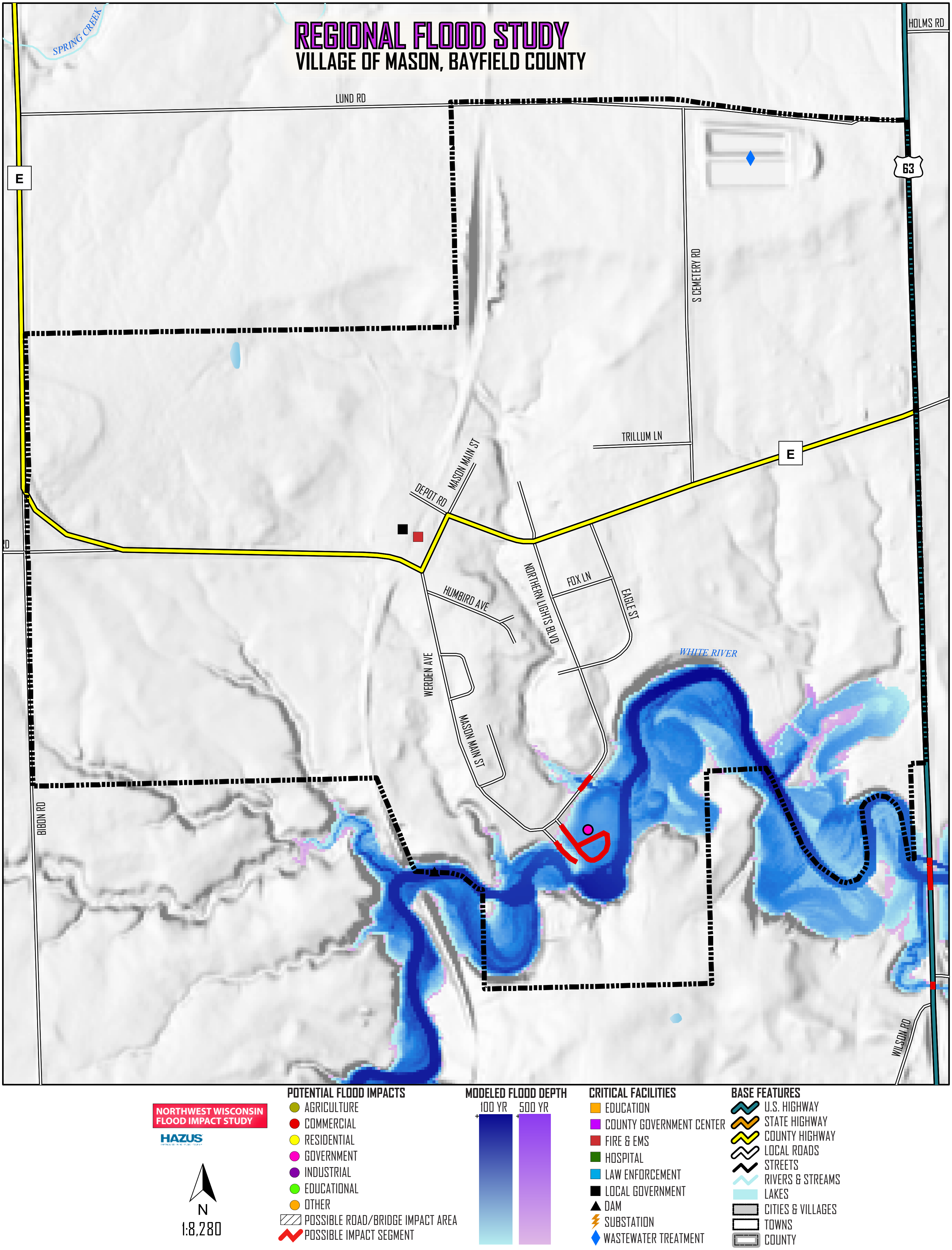

REGIONAL FLOOD STUDY
T43 & 44N, R7W, BAYFIELD COUNTY
T. DRUMMOND
T. GRANDVIEW
T. CABLE
T. NAMAKAGON
T. LENROOT
T. SPIDER LAKE
Lake Owen
Namekagon River
Fivemile Creek
Cap Creek
Fondeau Creek
Big Brook
Eighteenmile Creek
Cable Lake
Diamond Lake
Lake Tahkodah
Sugar Bush Lake
Northeast Lake
Crystal Lake
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
1:85,470
N



REGIONAL FLOOD STUDY
T43 & 44N, R6W, BAYFIELD COUNTY
T. LINCOLN
T. DRUMMOND
T. GRANDVIEW
T. CABLE
T. NAMAKAGON
T. SPIDER LAKE
CAMP EIGHT RD
CLUB LAKE DR
WISCO RD
OLD GRADE RD
OTTO OLSON DR
CUT ACROSS RD
W HORSESHOE RD
E HORSESHOE RD
S LAKE OWEN DR
RYBERG LAKE RD
KIMBALL RD
N DIAMOND LAKE DR
RYANS RD
TRIANGLE DR
PIONEER RD
CRYSTAL LAKE RD
ATKINS LAKE LN
GARDEN LAKE RD
DAM RD
OLD D RD
GARMISCH RD
MCCANN SPRINGS RD
FRELS RD
ROCK LAKE RD
GHOST CREEK RD
EHRMAN RD
Lake Osborn
Eighteenmile Creek Springs
Deer Lick Lake
Little Hidden Lake
Pre-emption Creek Pond
East Davis Lake
West Davis Lake
Spruce Lake
Adeline Lake
Lake Sixteen
Lake Owen
Porcupine Lake
Lake Lizzie
Holmes Lake
Club Lake
Ramstead Creek
Eighteenmile Creek
Coburn Lake
Ryberg Lake
Bass Lake
Atkins Lake
Jackson Creek
Lake Knotting
Northeast Lake
Lake Ree
Friedbauer Lake
Bullhead Lake
Diamond Lake
Trapper Lake
Taylor Creek
Taylor Lake
Sugar Bush Lake
Southwest Lake
Cranberry Lake
Jackson Lake
Crystal Lake
Little Bass Lake
Namekagon River
Namekagon Lake
Tank Lake
Castle Creek
Garden Lake
Fivemile Creek
Twin Lakes
South Twin Lake
Casper Lake
Hidden Lake
Ghost Lake
Cap Creek
Rock Lake
Emerson Lake
Frels Lake
Trout Lake
Hildebrand Lake
Birch Lake
Spring Lake
McCloud Lake
East Fork Ghost Creek
McClaine Lake
Patsy Lake
Star Lake
Grant Lake
Hope Lake
Ghost Creek
Evelyn Lake
D
M
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,570
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T43 & 44N, R5W, BAYFIELD COUNTY
T. LINCOLN
T. GRANDVIEW
T. MARENGO
T. NAMAKAGON
T. GORDON
T. SPIDER LAKE
CAMP EIGHT RD
ASHLAND BAYFIELD RD
HAKALA RD
SNAKE TRL
WISCO RD
OLD GRADE RD
CLUB LAKE DR
ATKINS LAKE LN
FOX FARM RD
PIONEER RD
TRIANGLE DR
NAMAKAGON RD
TN RD 42
SNAKE TRAIL RD
FOREST RD 344
FOREST RD 193
EHRMAN RD
GARDEN LAKE RD
WILDERNESS RD
JOB CORP RD
CHIPPEWA LAKE RD
DELLS RD
MCCANN SPRINGS RD
GHOST CREEK RD
LAKE FIVE RD
BUFFALO LAKE RD
Pre-emption Creek Pond
West Davis Lake
East Davis Lake
Lake Lizzie
Holmes Lake
Club Lake
Bass Lake
Atkins Lake
Jackson Creek
Friedbauer Lake
Trapper Lake
Taylor Creek
Taylor Lake
Bullhead Lake
Cranberry Lake
Seitz Lake
Spring Brook
Beaver Lake
Whisky Creek
Tea Lake
Coffee Lake
Marengo River
Spruce Lake
Blaser Creek
Namekagon Lake
Little Bass Lake
Tank Lake
Castle Creek
Garden Lake
Chippewa Lake
Duck Lake
Mud Lake
Casper Lake
Ghost Lake
Day Lake
Dells Lake
Range Line Lake
Ghost Creek
Muskie Springs Lake
Lake Five
Buffalo Lake
East Fork Ghost Creek
Red Ike Creek
Upper Clam Lake
Little Clam Lake
McCloud Lake
Lynch Creek
Evelyn Lake
Grant Lake
Hadley Lake
Lower Clam Lake
D
M
77
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,770
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
CITY OF BAYFIELD, BAYFIELD COUNTY
MARTIN RD
MEYERS - OLSON RD
13
LYNDE AVE
N 1ST ST
N FRONT ST
RICE AVE
RICE AVE
CEMETERY RD
10TH ST
WASHINGTON AVE
N 6TH ST
N 5TH ST
N 4TH ST
N 2ND S
N 9TH ST
N 8TH ST
N 7TH ST
S 5TH ST
S 4TH ST
BROAD ST
S 2ND ST
S 1ST ST
FERRY SERVICE
MANYPENNY AVE
S 11TH ST
S 10TH ST
S 9TH ST
S 8TH ST
S 3RD ST
WILSON AVE
S 7TH ST
OLD MILITARY RD
13
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:9,000
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF MASON, BAYFIELD COUNTY
SPRING CREEK
LUND RD
HOLMS RD
E
63
S CEMETERY RD
TRILLUM LN
MASON MAIN ST
DEPOT RD
HUMBIRD AVE
NORTHERN LIGHTS BLVD
FOX LN
EAGLE ST
WERDEN AVE
WHITE RIVER
BIBON RD
WILSON RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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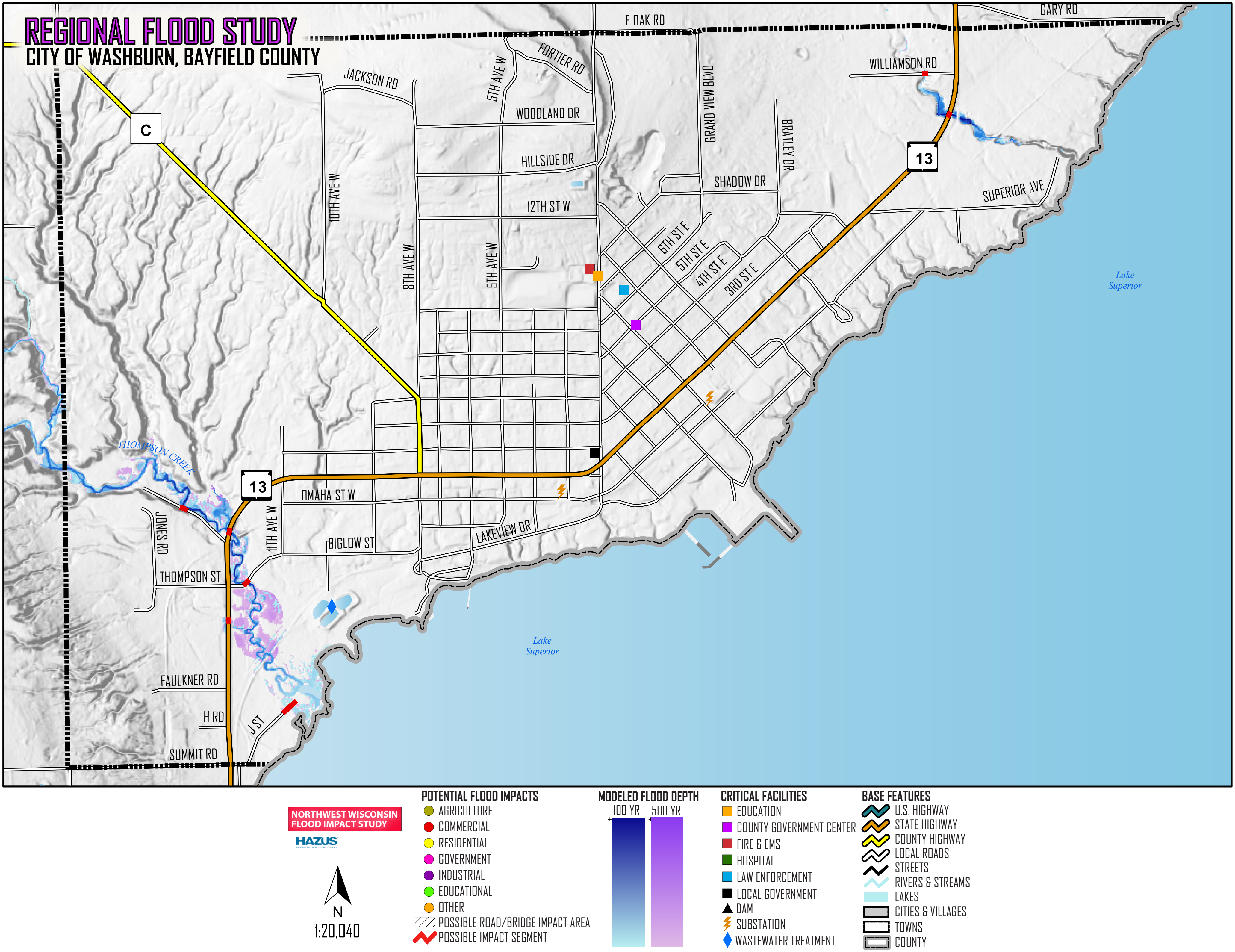
1:8,280
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
CITY OF WASHBURN, BAYFIELD COUNTY
E OAK RD
GARY RD
JACKSON RD
FORTIER RD
5TH AVE W
WOODLAND DR
HILLSIDE DR
12TH ST W
GRAND VIEW BLVD
WILLIAMSON RD
BRATLEY DR
SHADOW DR
SUPERIOR AVE
10TH AVE W
8TH AVE W
6TH ST E
5TH ST E
4TH ST E
3RD ST E
C
13
Lake Superior
THOMPSON CREEK
OMAHA ST W
JONES RD
11TH AVE W
BIGLOW ST
LAKEVIEW DR
THOMPSON ST
FAULKNER RD
H RD
J ST
SUMMIT RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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1:20,040
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

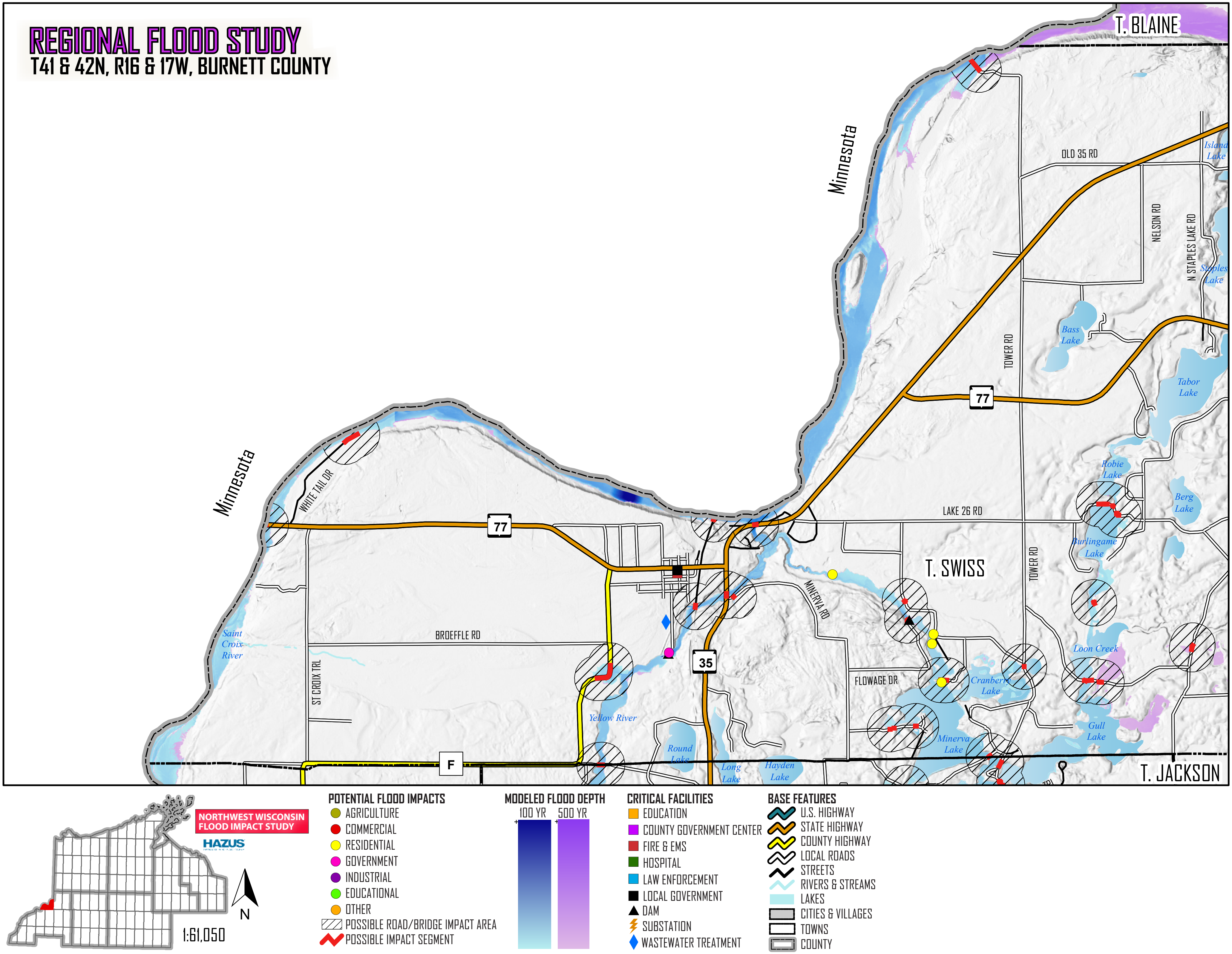
BURNETT COUNTY

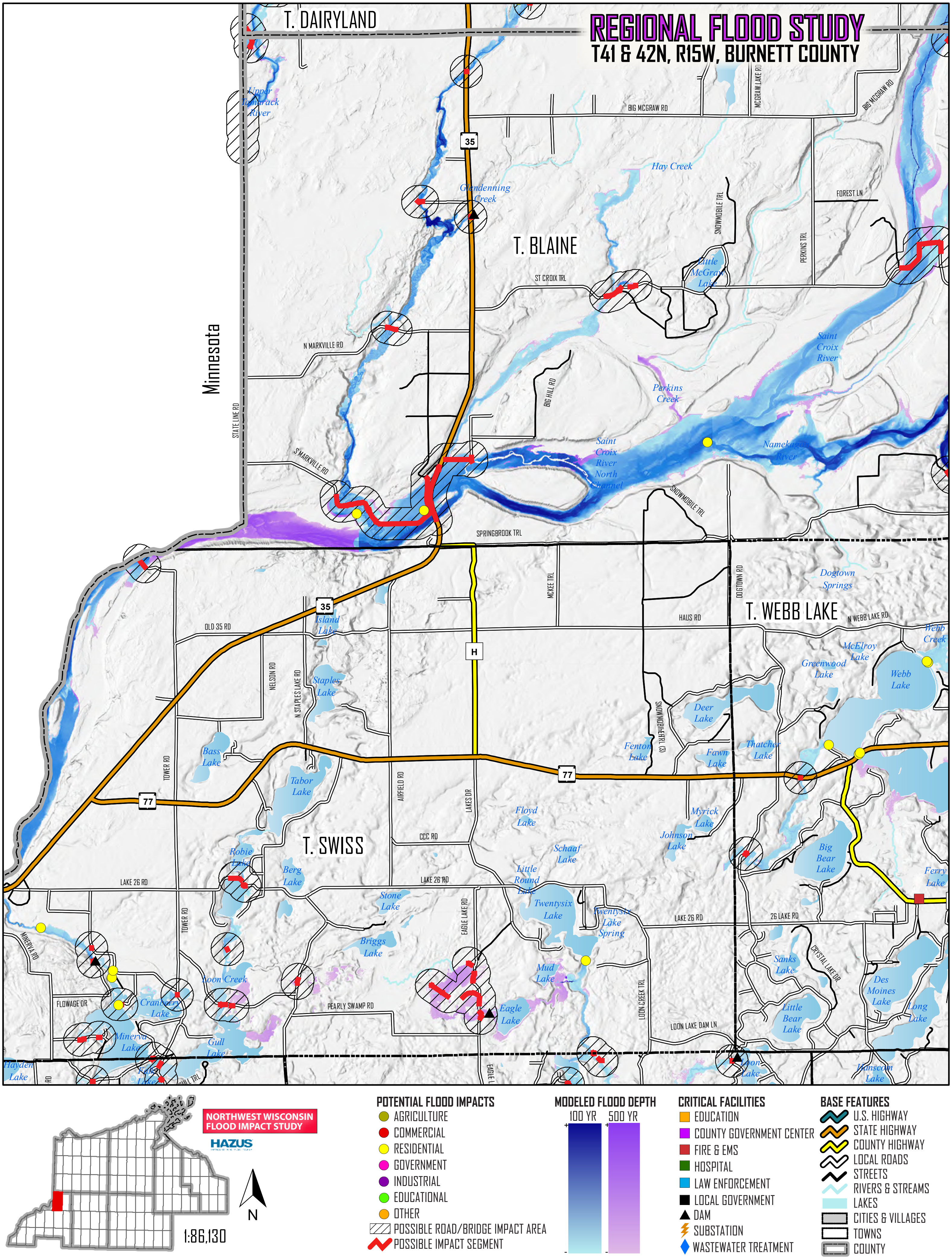
HAZUS 100-YEAR FLOOD LOSS ESTIMATES - BURNETT COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
T. OF ANDERSON	2	$ 52,889.00	$ 15,732.00	$ -	19
T. OF BLAINE	3	$ 76,410.00	$ 22,371.00	$ -	14
T. OF DANIELS	17	$ 334,046.00	$ 139,606.00	$ 31,034.00	215
T. OF DEWEY	3	$ 73,699.00	$ 22,561.00	$ -	20
T. OF GRANTSBURG	6	$ 79,290.00	$ 42,726.00	$ -	41
T. OF JACKSON	1	$ 3,080.00	$ 848.00	$ -	15
T. OF LA FOLLETTE	7	$ 95,250.00	$ 30,262.00	$ -	47
T. OF LINCOLN	4	$ 31,426.00	$ 11,021.00	$ -	51
T. OF MEENON	24	$ 441,722.00	$ 202,826.00	$ -	227
T. OF OAKLAND	10	$ 243,533.00	$ 89,340.00	$ -	74
T. OF ROOSEVELT	2	$ 3,039.00	$ 755.00	$ -	9
T. OF RUSK	3	$ 190,444.00	$ 84,858.00	$ -	371
T. OF SAND LAKE	2	$ 14,680.00	$ 2,631.00	$ -	18
T. OF SIREN	13	$ 304.00	$ 557.00	$ -	54
T. OF SWISS	3	$ 32,077.00	$ 63,298.00	$ -	21
T. OF TRADE LAKE	25	$ 260,784.00	$ 155,163.00	$ -	177
T. OF UNION	4	$ 71,090.00	$ 31,156.00	$ -	62
T. OF WEBB LAKE	3	$ 13,440.00	$ 1,215.00	$ -	24
T. OF WOOD RIVER	3	$ 851.00	$ 344.00	$ -	11
V. OF GRANTSBURG	3	$ 16,832.00	$ 6,074.00	$ -	38
GRAND TOTAL	**138**	**$ 2,034,886.00**	**$ 923,344.00**	**$ 31,034.00**	**1,508**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - BURNETT COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
T. OF ANDERSON	3	$ 55,845.00	$ 16,428.00	$ -	31
T. OF BLAINE	3	$ 86,663.00	$ 24,475.00	$ -	19
T. OF DANIELS	20	$ 367,347.00	$ 157,089.00	$ 39,815.00	263
T. OF DEWEY	3	$ 77,503.00	$ 23,469.00	$ -	20
T. OF GRANTSBURG	8	$ 207,878.00	$ 87,262.00	$ -	155
T. OF JACKSON	1	$ 3,080.00	$ 1,131.00	$ -	15
T. OF LA FOLLETTE	7	$ 149,945.00	$ 45,669.00	$ -	55
T. OF LINCOLN	4	$ 45,420.00	$ 16,956.00	$ -	51
T. OF MEENON	29	$ 634,770.00	$ 481,258.00	$ -	304
T. OF OAKLAND	12	$ 304,648.00	$ 110,214.00	$ -	91
T. OF ROOSEVELT	1	$ -	$ -	$ -	6
T. OF RUSK	7	$ 209,604.00	$ 90,125.00	$ -	397
T. OF SAND LAKE	4	$ 31,066.00	$ 12,261.00	$ -	26
T. OF SCOTT	1	$ 6,806.00	$ 2,674.00	$ -	9
T. OF SIREN	25	$ 7,771.00	$ 4,778.00	$ -	135
T. OF SWISS	6	$ 64,238.00	$ 75,859.00	$ -	51
T. OF TRADE LAKE	28	$ 344,636.00	$ 192,624.00	$ -	201
T. OF UNION	6	$ 113,355.00	$ 42,411.00	$ -	78
T. OF WEBB LAKE	6	$ 25,048.00	$ 50,903.00	$ -	37
T. OF WOOD RIVER	3	$ 6,725.00	$ 3,173.00	$ -	11
V. OF GRANTSBURG	3	$ 24,770.00	$ 10,625.00	$ -	38
GRAND TOTAL	**180**	**$ 2,767,118.00**	**$ 1,449,384.00**	**$ 39,815.00**	**1,993**


REGIONAL FLOOD STUDY
T41 & 42N, R16 & 17W, BURNETT COUNTY
T. BLAINE
T. SWISS
T. JACKSON
Minnesota
Minnesota
OLD 35 RD
NELSON RD
N STAPLES LAKE RD
TOWER RD
TOWER RD
LAKE 26 RD
MINERVA RD
FLOWAGE DR
WHITE TAIL DR
BROEFFLE RD
ST CROIX TRL
77
77
35
F
Island Lake
Staples Lake
Bass Lake
Tabor Lake
Robie Lake
Berg Lake
Burlingame Lake
Loon Creek
Cranberry Lake
Gull Lake
Minerva Lake
Hayden Lake
Long Lake
Round Lake
Yellow River
Saint Croix River
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:61,050
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R15W, BURNETT COUNTY
T. DAIRYLAND
T. BLAINE
T. WEBB LAKE
T. SWISS
Minnesota
Upper Tamarack River
Glendenning Creek
Hay Creek
Little McGraw Lake
Saint Croix River
Perkins Creek
Saint Croix River North Channel
Namekagon River
Dogtown Springs
Island Lake
Staples Lake
Bass Lake
Tabor Lake
Robie Lake
Berg Lake
Stone Lake
Briggs Lake
Loon Creek
Cranberry Lake
Minerva Lake
Gull Lake
Hayden Lake
Floyd Lake
Schaaf Lake
Little Round Lake
Twentysix Lake
Twentysix Lake Spring
Mud Lake
Eagle Lake
Deer Lake
Fenton Lake
Fawn Lake
Thatcher Lake
Myrick Lake
Johnson Lake
Big Bear Lake
Greenwood Lake
McElroy Lake
Webb Lake
Webb Creek
Ferry Lake
Sanks Lake
Little Bear Lake
Des Moines Lake
Long Lake
Hanscom Lake
Loon Lake
BIG MCGRAW RD
MCGRAW LAKE RD
FOREST LN
SNOWMOBILE TRL
PERKINS TRL
ST CROIX TRL
N MARKVILLE RD
S MARKVILLE RD
BIG HILL RD
STATE LINE RD
SPRINGBROOK TRL
MCKEE TRL
DOGTOWN RD
HAUS RD
N WEBB LAKE RD
OLD 35 RD
NELSON RD
N STAPLES LAKE RD
TOWER RD
AIRFIELD RD
LAKES DR
CCC RD
LAKE 26 RD
26 LAKE RD
EAGLE LAKE RD
LOON CREEK TRL
LOON LAKE DAM LN
CRYSTAL LAKE DR
MINERVA RD
FLOWAGE DR
PEARLY SWAMP RD
35
77
H
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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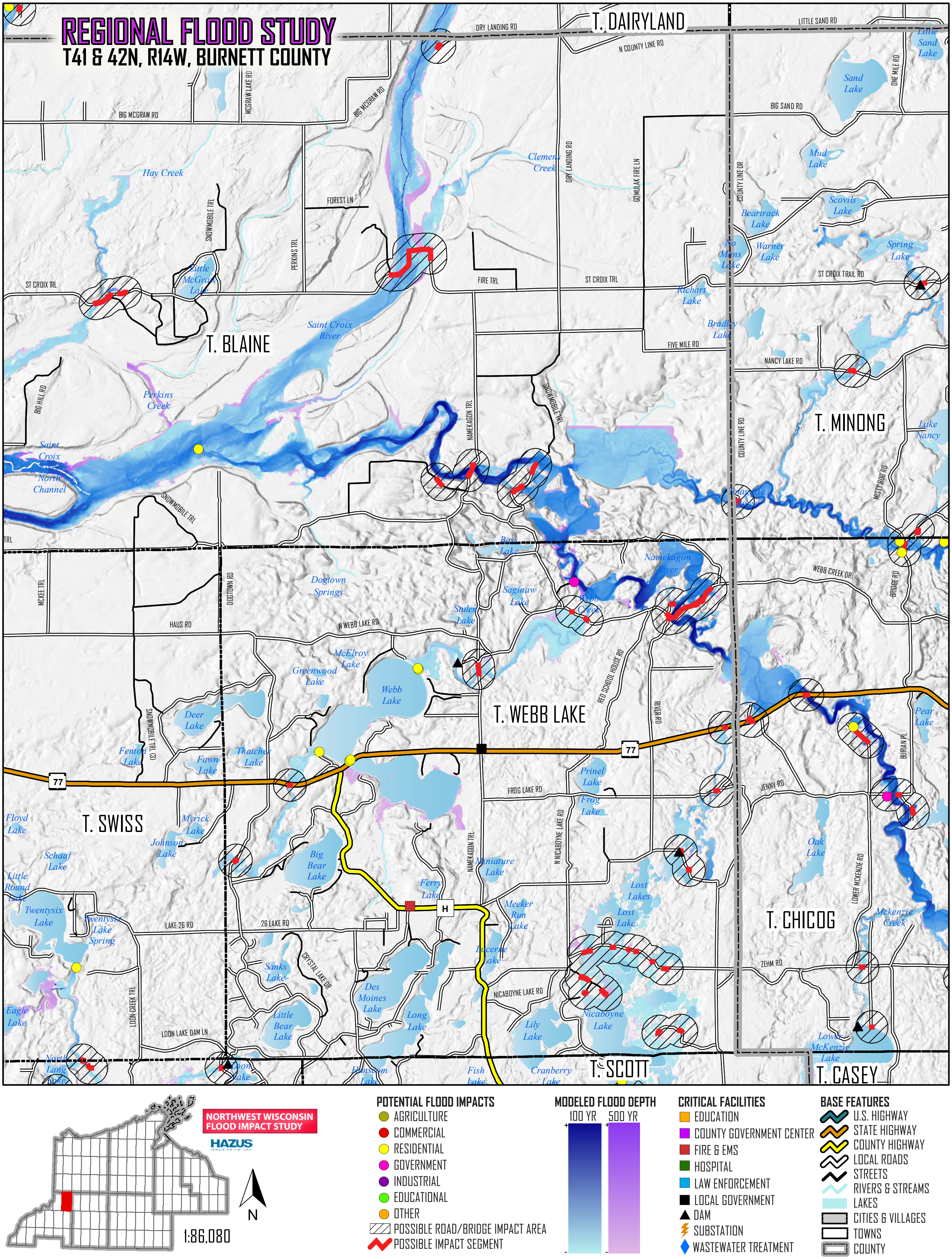

REGIONAL FLOOD STUDY
T41 & 42N, R14W, BURNETT COUNTY
T. DAIRYLAND
T. BLAINE
T. MINONG
T. WEBB LAKE
T. SWISS
T. CHICOG
T. SCOTT
T. CASEY
Saint Croix River
Namekagon River
Hay Creek
Clemens Creek
Perkins Creek
Webb Creek
Mckenzie Creek
Webb Lake
Big Bear Lake
Sand Lake
Mud Lake
Scovils Lake
Spring Lake
Lake Nancy
Pear Lake
Oak Lake
Deer Lake
Fenton Lake
Thatcher Lake
Fawn Lake
Prinel Lake
Frog Lake
Myrick Lake
Johnson Lake
Floyd Lake
Schaaf Lake
Twentysix Lake
Eagle Lake
Sanks Lake
Des Moines Lake
Little Bear Lake
Long Lake
Lily Lake
Nicaboyne Lake
Lost Lakes
Lost Lake
Meeker Run Lake
Miniature Lake
Ferry Lake
Saginaw Lake
Bass Lake
McElroy Lake
Greenwood Lake
Dogtown Springs
Cranberry Lake
Fish Lake
Lower McKenzie Lake
ST CROIX TRL
FIVE MILE RD
NANCY LAKE RD
WEBB CREEK DR
N WEBB LAKE RD
HAUS RD
FROG LAKE RD
JENNY RD
LAKE 26 RD
26 LAKE RD
NICABOYNE LAKE RD
LOON LAKE DAM LN
ZEHM RD
BIG MCGRAW RD
DRY LANDING RD
LITTLE SAND RD
BIG SAND RD
77
H
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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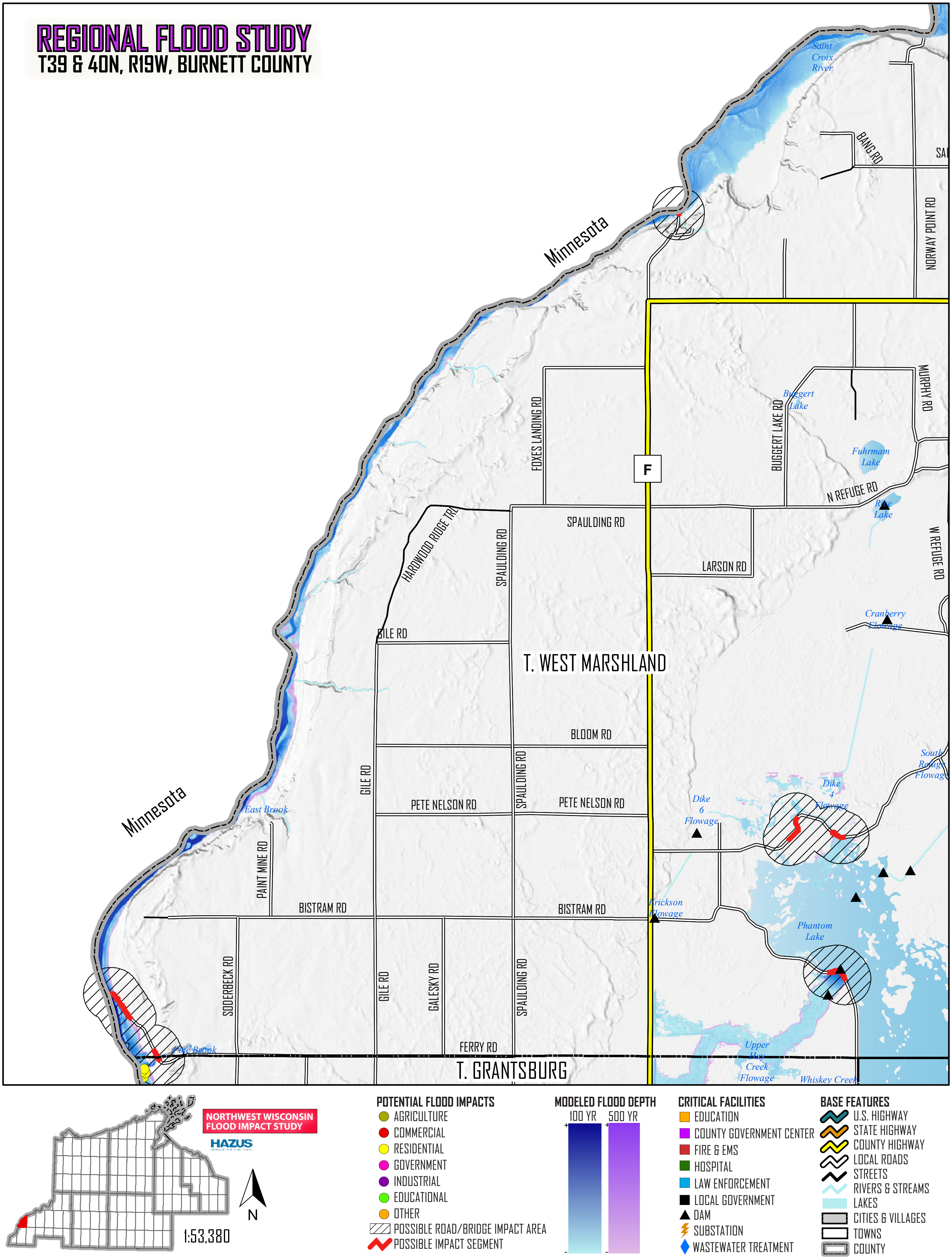
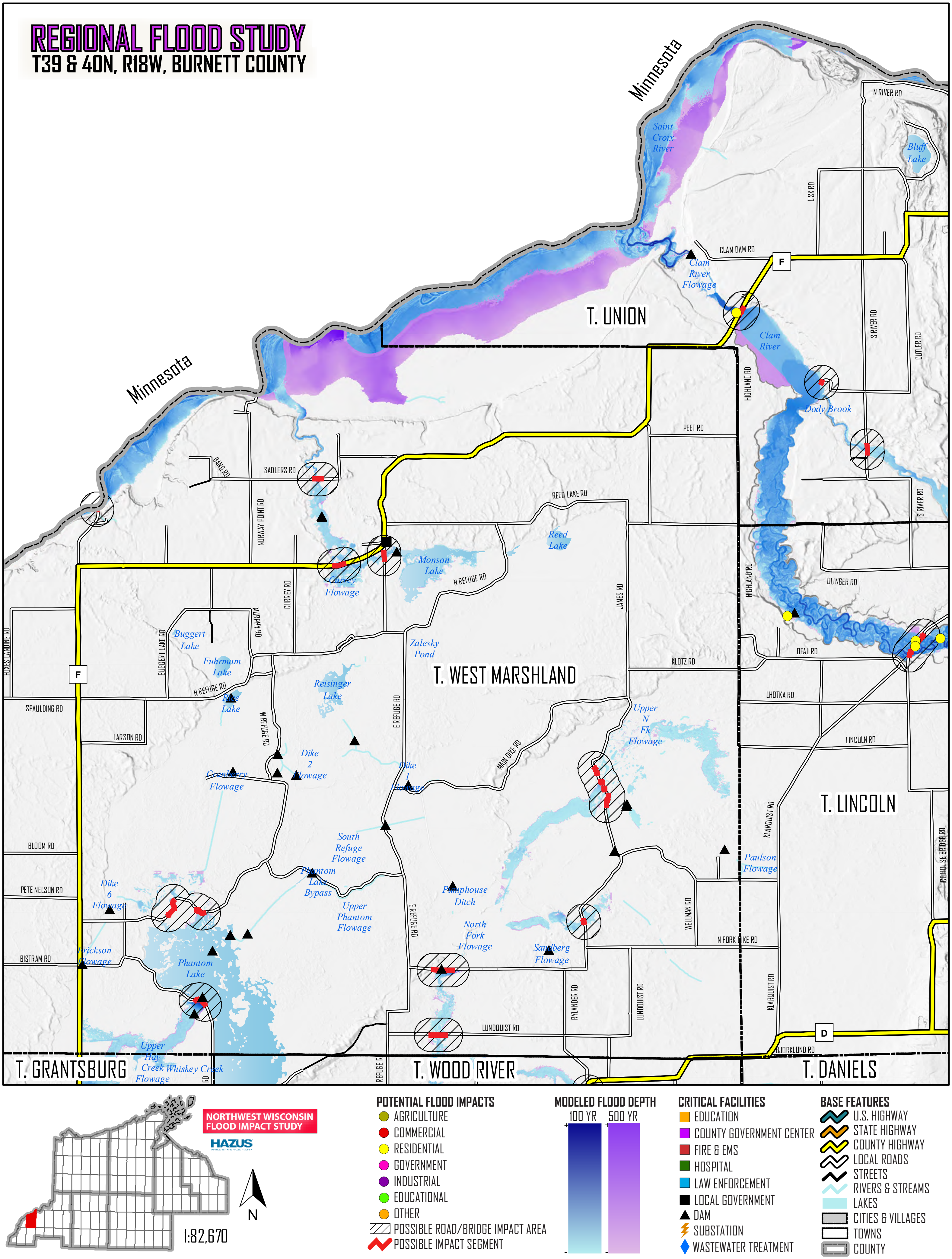
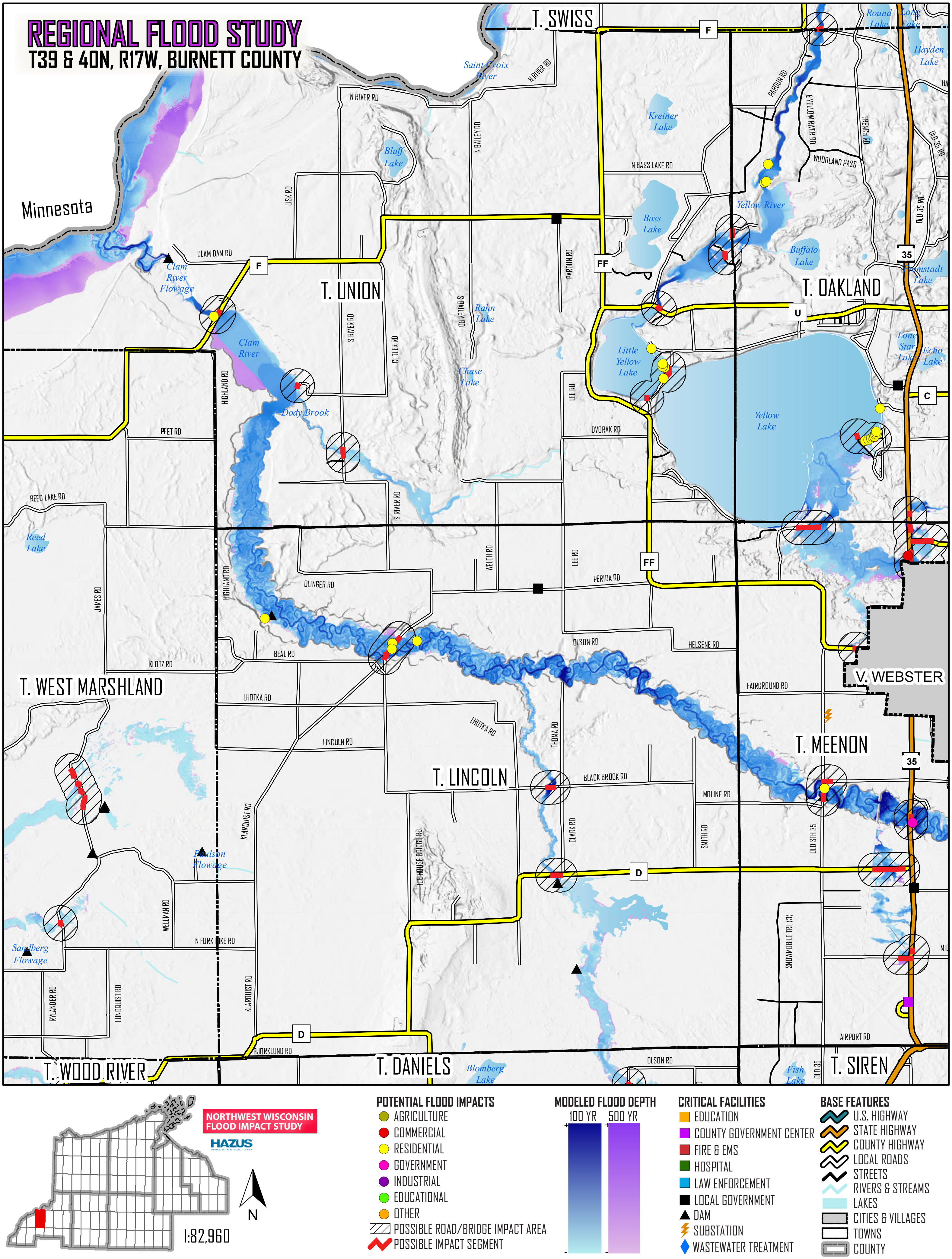
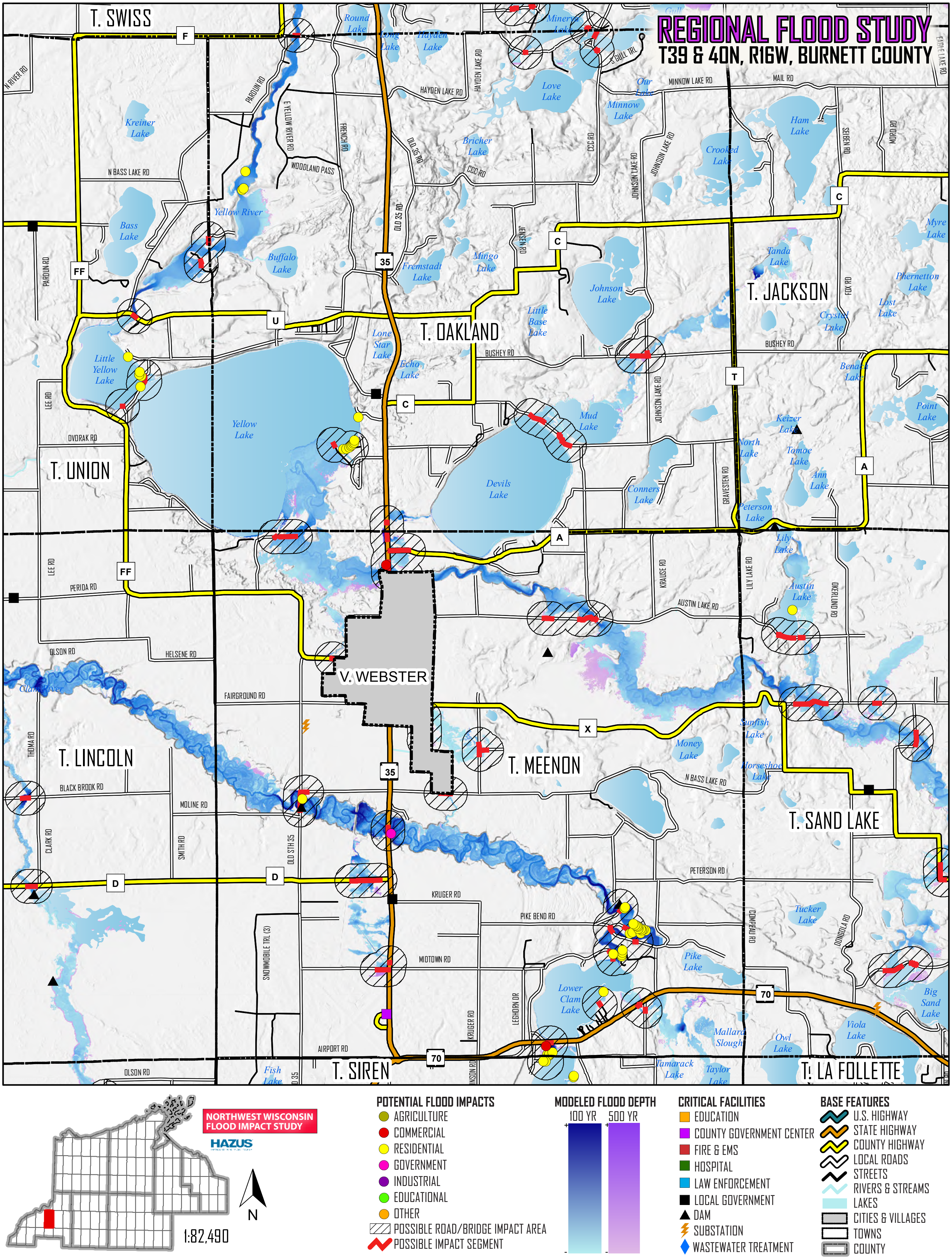

REGIONAL FLOOD STUDY
T39 & 40N, R19W, BURNETT COUNTY
Saint Croix River
Minnesota
Minnesota
BANG RD
NORWAY POINT RD
MURPHY RD
Buggert Lake
BUGGERT LAKE RD
Fuhrmam Lake
N REFUGE RD
Rice Lake
W REFUGE RD
Cranberry Flowage
FOXES LANDING RD
F
SPAULDING RD
HARDWOOD RIDGE TRL
SPAULDING RD
LARSON RD
GILE RD
T. WEST MARSHLAND
BLOOM RD
GILE RD
SPAULDING RD
PETE NELSON RD
PETE NELSON RD
South Refuge Flowage
Dike 4 Flowage
Dike 6 Flowage
East Brook
PAINT MINE RD
BISTRAM RD
BISTRAM RD
Erickson Flowage
Phantom Lake
SODERBECK RD
GILE RD
GALESKY RD
SPAULDING RD
FERRY RD
Pine Brook
T. GRANTSBURG
Upper Hay Creek Flowage
Whiskey Creek
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:53,380
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
+
-
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R18W, BURNETT COUNTY
Minnesota
Minnesota
Saint Croix River
Bluff Lake
N RIVER RD
LISK RD
CLAM DAM RD
Clam River Flowage
F
T. UNION
Clam River
HIGHLAND RD
S RIVER RD
CUTLER RD
Dody Brook
PEET RD
SADLERS RD
BANG RD
NORWAY POINT RD
REED LAKE RD
Reed Lake
Monson Lake
N REFUGE RD
Currey Flowage
CURREY RD
OLINGER RD
MURPHY RD
JAMES RD
Buggert Lake
Fuhrmam Lake
BUGGERT LAKE RD
FOXES LANDING RD
Zalesky Pond
T. WEST MARSHLAND
KLOTZ RD
BEAL RD
N REFUGE RD
Reisinger Lake
Rice Lake
SPAULDING RD
LHOTKA RD
W REFUGE RD
E REFUGE RD
Upper N Fk Flowage
LARSON RD
LINCOLN RD
Dike 2 Flowage
Dike 1 Flowage
MAIN DIKE RD
Cranberry Flowage
T. LINCOLN
KLARQUIST RD
BLOOM RD
South Refuge Flowage
Paulson Flowage
ICE HOUSE BRIDGE RD
Phantom Lake Bypass
PETE NELSON RD
Dike 6 Flowage
Pumphouse Ditch
Upper Phantom Flowage
WELLMAN RD
North Fork Flowage
N FORK DIKE RD
BISTRAM RD
Erickson Flowage
Sandberg Flowage
Phantom Lake
RYLANDER RD
LUNDQUIST RD
LUNDQUIST RD
D
BJORKLUND RD
Upper Hay Creek Whiskey Creek Flowage
T. GRANTSBURG
T. WOOD RIVER
T. DANIELS
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:82,670
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T39 & 40N, R17W, BURNETT COUNTY
Minnesota
T. SWISS
T. UNION
T. OAKLAND
T. WEST MARSHLAND
T. LINCOLN
T. MEENON
V. WEBSTER
T. WOOD RIVER
T. DANIELS
T. SIREN
Saint Croix River
Clam River Flowage
Clam River
Dody Brook
Bluff Lake
Kreiner Lake
Bass Lake
Buffalo Lake
Yellow River
Little Yellow Lake
Yellow Lake
Rahn Lake
Chase Lake
Reed Lake
Round Lake
Long Lake
Hayden Lake
Lone Star Lake
Echo Lake
Fish Lake
Blomberg Lake
Sandberg Flowage
Paulson Flowage
N RIVER RD
N BAILEY RD
N BASS LAKE RD
PARDUN RD
YELLOW RIVER RD
FRENCH RD
OLD 35 RD
WOODLAND PASS
LUSK RD
CLAM DAM RD
S RIVER RD
CUTLER RD
S BAILEY RD
HIGHLAND RD
LEE RD
DVORAK RD
PEET RD
REED LAKE RD
JAMES RD
OLINGER RD
WELCH RD
PERIDA RD
BEAL RD
KLOTZ RD
OLSON RD
HELSENE RD
FAIRGROUND RD
LHOTKA RD
LINCOLN RD
THOMA RD
BLACK BROOK RD
MOLINE RD
CLARK RD
SMITH RD
OLD STH 35
KLARQUIST RD
ICE HOUSE BRIDGE RD
WELLMAN RD
N FORK PIKE RD
SNOWMOBILE TRL (3)
RYLANDER RD
LUNDQUIST RD
BJORKLUND RD
AIRPORT RD
OLD 35
F
FF
U
C
D
35
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:82,960
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T39 & 40N, R16W, BURNETT COUNTY
T. SWISS
T. OAKLAND
T. JACKSON
T. UNION
T. LINCOLN
T. MEENON
T. SAND LAKE
T. SIREN
T. LA FOLLETTE
V. WEBSTER
Yellow Lake
Little Yellow Lake
Devils Lake
Yellow River
Clam River
Lower Clam Lake
Big Sand Lake
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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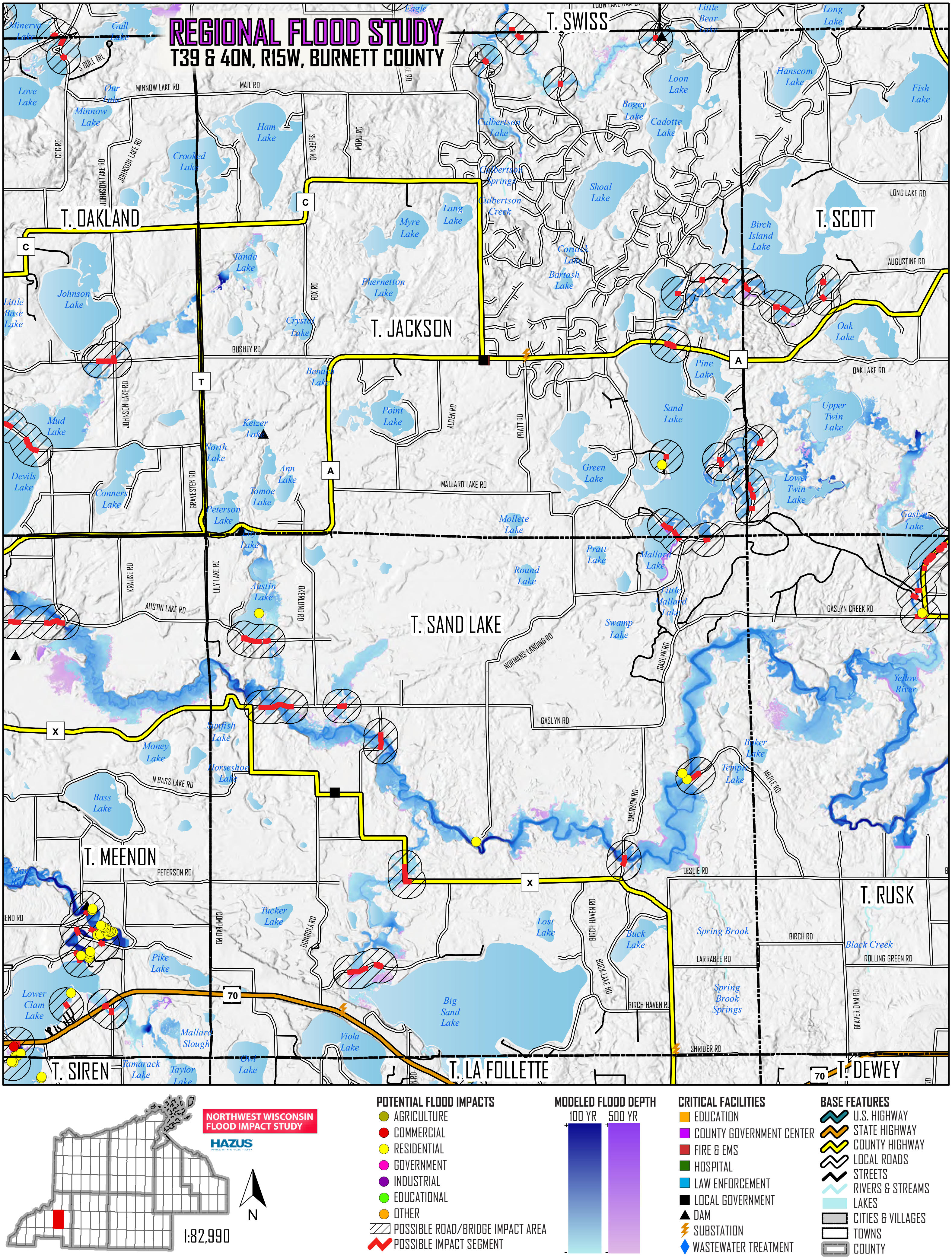
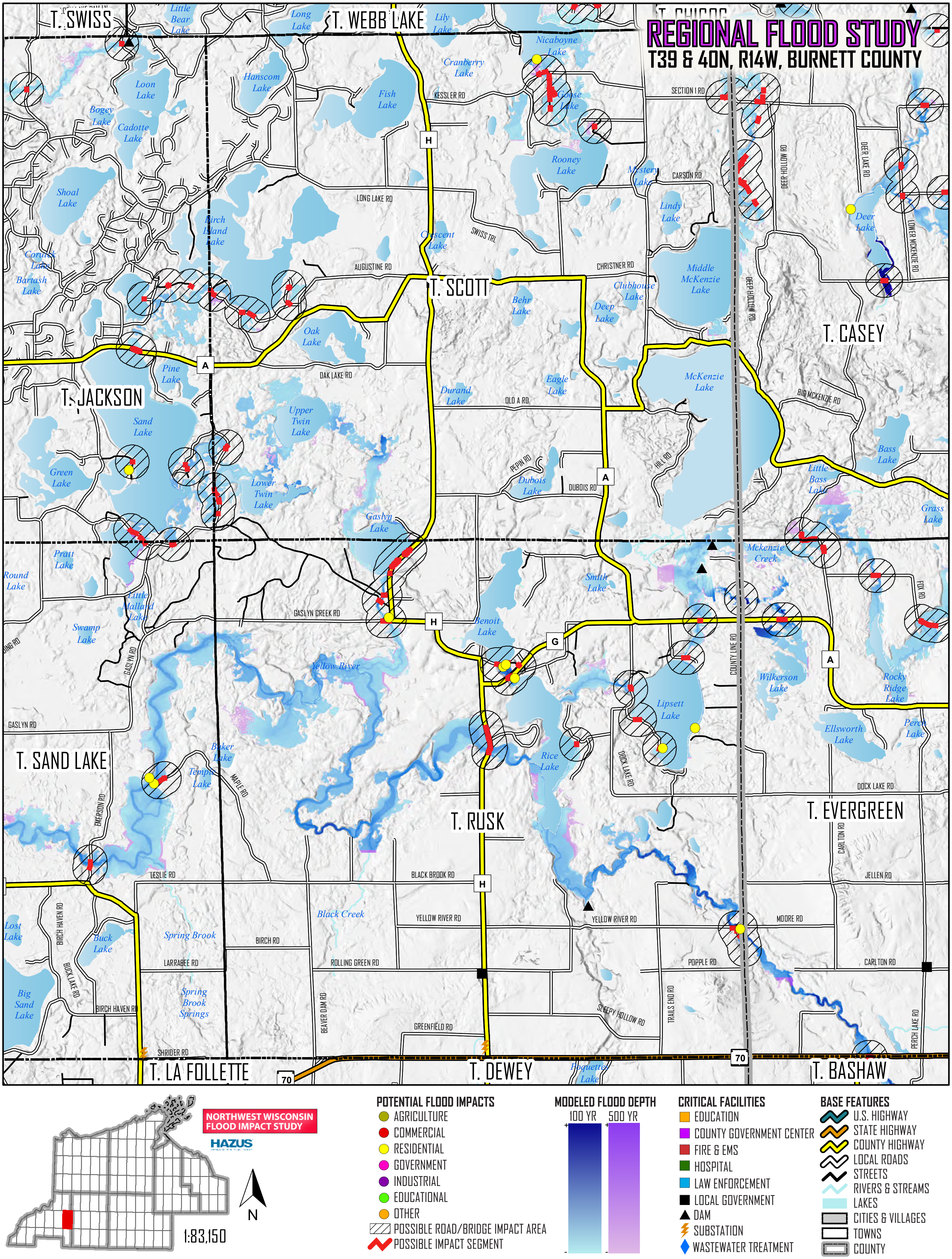


REGIONAL FLOOD STUDY
T39 & 40N, R15W, BURNETT COUNTY
T. OAKLAND
T. SWISS
T. SCOTT
T. JACKSON
T. SAND LAKE
T. MEENON
T. RUSK
T. SIREN
T. LA FOLLETTE
T. DEWEY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:82,990
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R14W, BURNETT COUNTY
T. SWISS
T. WEBB LAKE
T. SCOTT
T. CASEY
T. JACKSON
T. SAND LAKE
T. RUSK
T. EVERGREEN
T. LA FOLLETTE
T. DEWEY
T. BASHAW
Little Bear Lake
Long Lake
Lily Lake
Nicaboyne Lake
Cranberry Lake
Loon Lake
Hanscom Lake
Fish Lake
Goose Lake
Bogey Lake
Cadotte Lake
Rooney Lake
Mystery Lake
Shoal Lake
Birch Island Lake
Crescent Lake
Lindy Lake
Deer Lake
Middle McKenzie Lake
Bartash Lake
Clubhouse Lake
Behr Lake
Deep Lake
Oak Lake
Pine Lake
McKenzie Lake
Durand Lake
Eagle Lake
Sand Lake
Upper Twin Lake
Bass Lake
Green Lake
Lower Twin Lake
Dubois Lake
Little Bass Lake
Grass Lake
Gaslyn Lake
Pratt Lake
Mckenzie Creek
Round Lake
Smith Lake
Little Mallard Lake
Swamp Lake
Benoit Lake
Yellow River
Wilkerson Lake
Rocky Ridge Lake
Lipsett Lake
Ellsworth Lake
Perch Lake
Baker Lake
Tempo Lake
Rice Lake
Black Creek
Lost Lake
Spring Brook
Buck Lake
Big Sand Lake
Spring Brook Springs
Paquette Lake
KESSLER RD
SECTION 1 RD
LONG LAKE RD
SWISS TRL
CARSON RD
DEER HOLLOW RD
DEER LAKE RD
AUGUSTINE RD
CHRISTNER RD
LOWER MCKENZIE RD
OAK LAKE RD
OLD A RD
BIG MCKENZIE RD
PEPIN RD
HILL RD
DUBOIS RD
GASLYN CREEK RD
GASLYN RD
COUNTY LINE RD
FOX RD
DOCK LAKE RD
MAPLE RD
EMERSON RD
CARLTON RD
LESLIE RD
BLACK BROOK RD
JELLEN RD
YELLOW RIVER RD
MOORE RD
BIRCH HAVEN RD
BIRCH RD
LARRABEE RD
ROLLING GREEN RD
POPPLE RD
BUCK LAKE RD
SLEEPY HOLLOW RD
TRAILS END RD
BEAVER DAM RD
GREENFIELD RD
PERCH LAKE RD
SHRIDER RD
H
A
G
70
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
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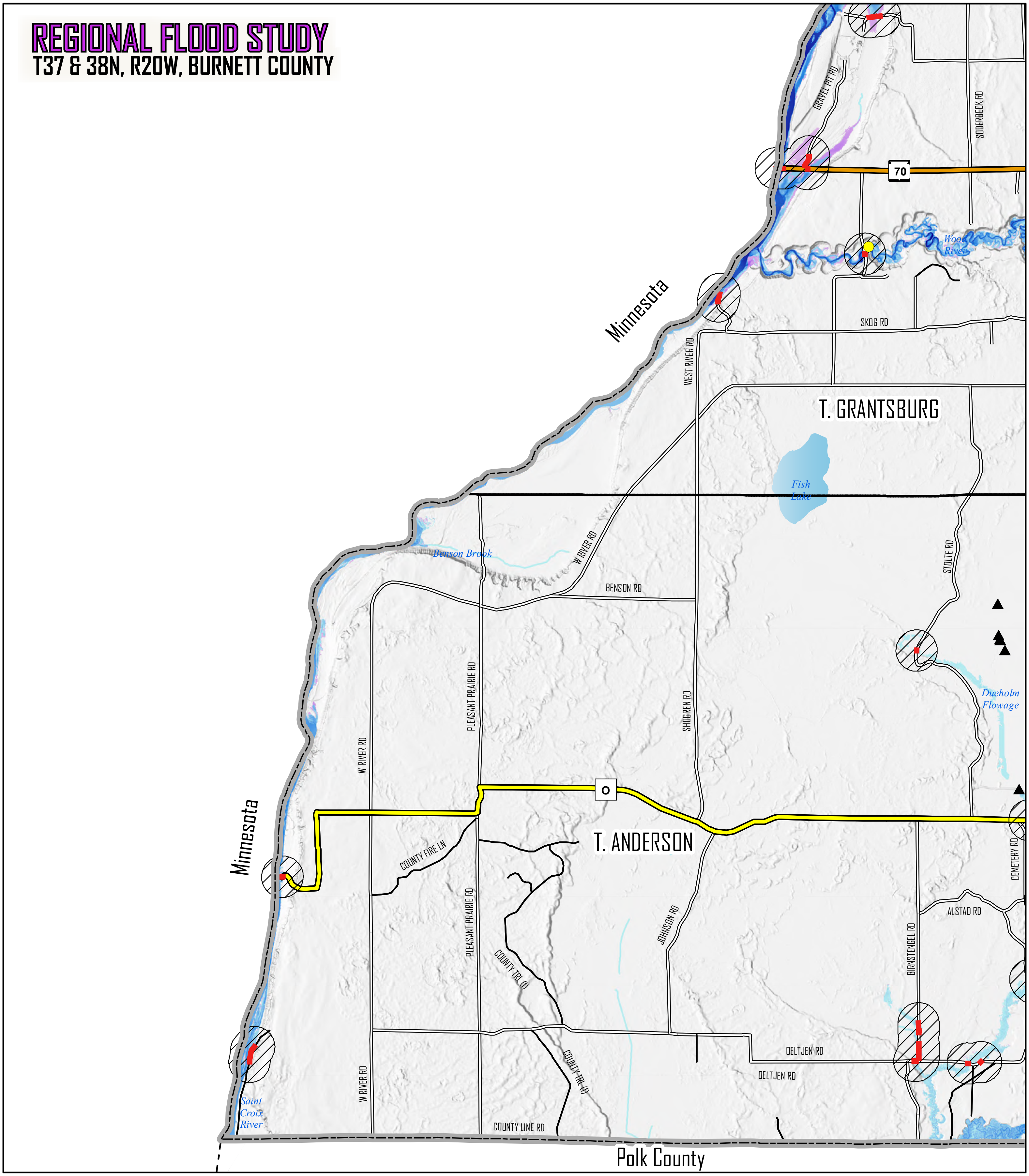
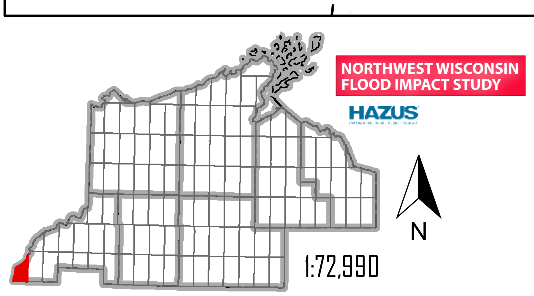


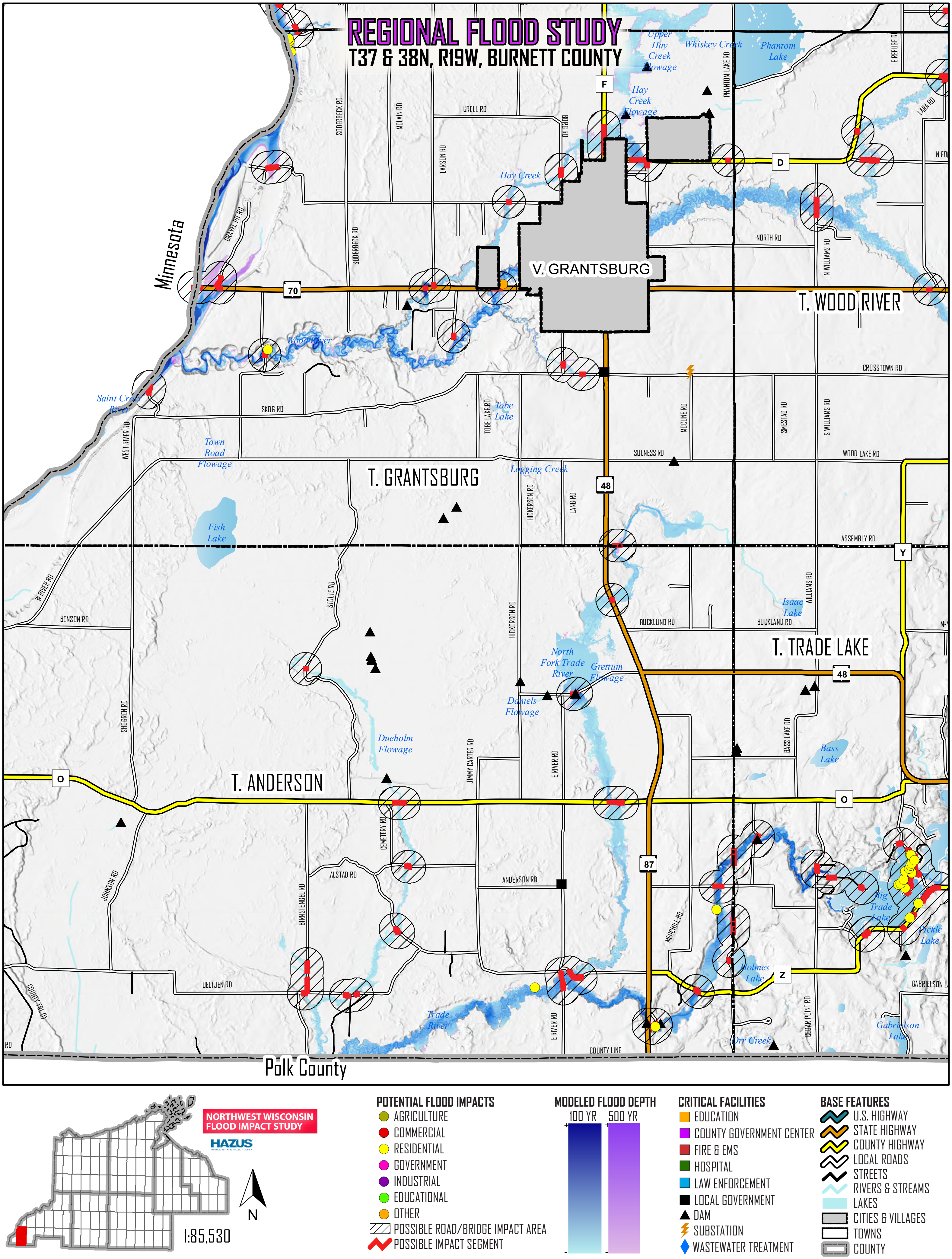


POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH
100 YR | 500 YR
+ / -

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R19W, BURNETT COUNTY
Minnesota
V. GRANTSBURG
T. WOOD RIVER
T. GRANTSBURG
T. TRADE LAKE
T. ANDERSON
Polk County
Upper Hay Creek Flowage
Whiskey Creek
Phantom Lake
Hay Creek Flowage
Hay Creek
Wood River
Saint Croix River
Tobe Lake
Town Road Flowage
Logging Creek
Fish Lake
North Fork Trade River
Grettum Flowage
Daniels Flowage
Dueholm Flowage
Isaac Lake
Bass Lake
Big Trade Lake
Pickle Lake
Holmes Lake
Trade River
Orr Creek
Gabrielson Lake
SODERBECK RD
MCLAIN RD
GRELL RD
LARSON RD
GRAVEL PIT RD
PHANTOM LAKE RD
E REFUGE RD
LARA RD
NORTH RD
N WILLIAMS RD
CROSSTOWN RD
SKOG RD
TOBE LAKE RD
MCCUNE RD
SMESTAD RD
S WILLIAMS RD
WEST RIVER RD
SOLNESS RD
WOOD LAKE RD
HICKERSON RD
LANG RD
ASSEMBLY RD
W RIVER RD
BENSON RD
STOLTE RD
WILLIAMS RD
BUCKLUND RD
BUCKLAND RD
SHOGREN RD
JIMMY CARTER RD
E RIVER RD
BASS LAKE RD
CEMETERY RD
ALSTAD RD
ANDERSON RD
JOHNSON RD
BIRNSTENGEL RD
MEDCHILL RD
OELTJEN RD
CEDAR POINT RD
GABRIELSON LN
COUNTY LINE
F
D
70
48
Y
O
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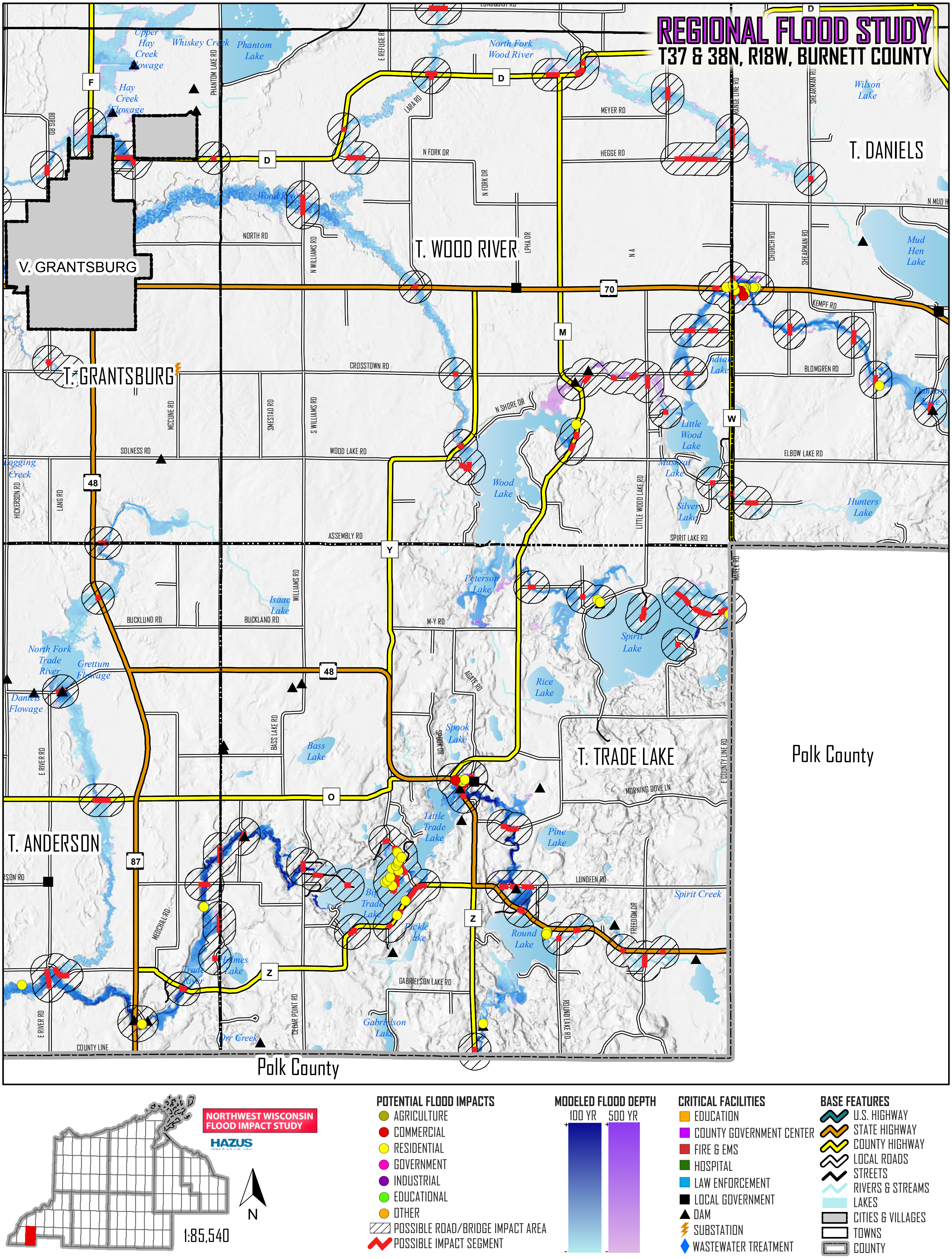
Z
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,530



REGIONAL FLOOD STUDY
T37 & 38N, R18W, BURNETT COUNTY
V. GRANTSBURG
T. GRANTSBURG
T. WOOD RIVER
T. DANIELS
T. TRADE LAKE
T. ANDERSON
Polk County
Polk County
Upper Hay Creek Flowage
Hay Creek Flowage
Whiskey Creek
Phantom Lake
North Fork Wood River
Wood River
Wilson Lake
Mud Hen Lake
Indian Lake
Little Wood Lake
Muskrat Lake
Silver Lake
Wood Lake
Hunters Lake
Dunham Lake
Logging Creek
Peterson Lake
Isaac Lake
Spirit Lake
Rice Lake
Spook Lake
Bass Lake
North Fork Trade River
Grettum Flowage
Daniels Flowage
Little Trade Lake
Pine Lake
Big Trade Lake
Pickle Lake
Round Lake
Spirit Creek
James Lake
Trade River
Gabrielson Lake
Orr Creek
BORG RD
PHANTOM LAKE RD
E REFUGE RD
LARA RD
MEYER RD
RANGE LINE RD
SHEARMAN RD
N FORK DR
HEGGE RD
NORTH RD
N WILLIAMS RD
LPHA DR
CHURCH RD
N MUD H
KEMPF RD
CROSSTOWN RD
BLOMGREN RD
N SHORE DR
MCCUNE RD
SMESTAD RD
S WILLIAMS RD
SOLNESS RD
WOOD LAKE RD
ELBOW LAKE RD
HICKERSON RD
LANG RD
LITTLE WOOD LAKE RD
ASSEMBLY RD
SPIRIT LAKE RD
MAREK RD
WILLIAMS RD
BUCKLUND RD
BUCKLAND RD
M-Y RD
AGATE RD
BASS LAKE RD
SPOOK DR
E RIVER RD
E COUNTY LINE RD
MORNING DOVE LN
MEDCHILL RD
LUNDEEN RD
FREEDOM DR
GABRIELSON LAKE RD
CEDAR POINT RD
ROUND LAKE RD
COUNTY LINE
F
D
70
M
W
48
Y
O
87
Z
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
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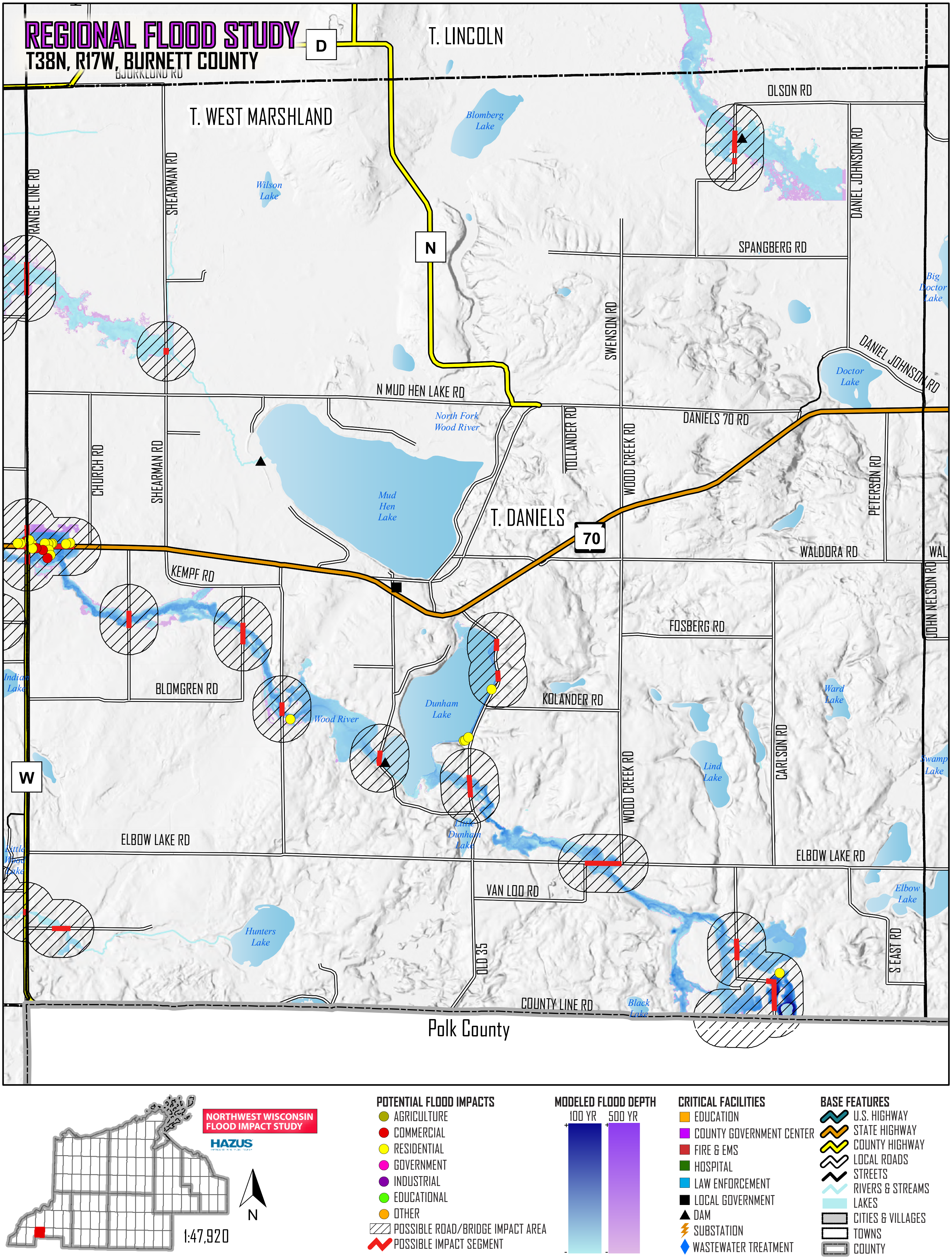
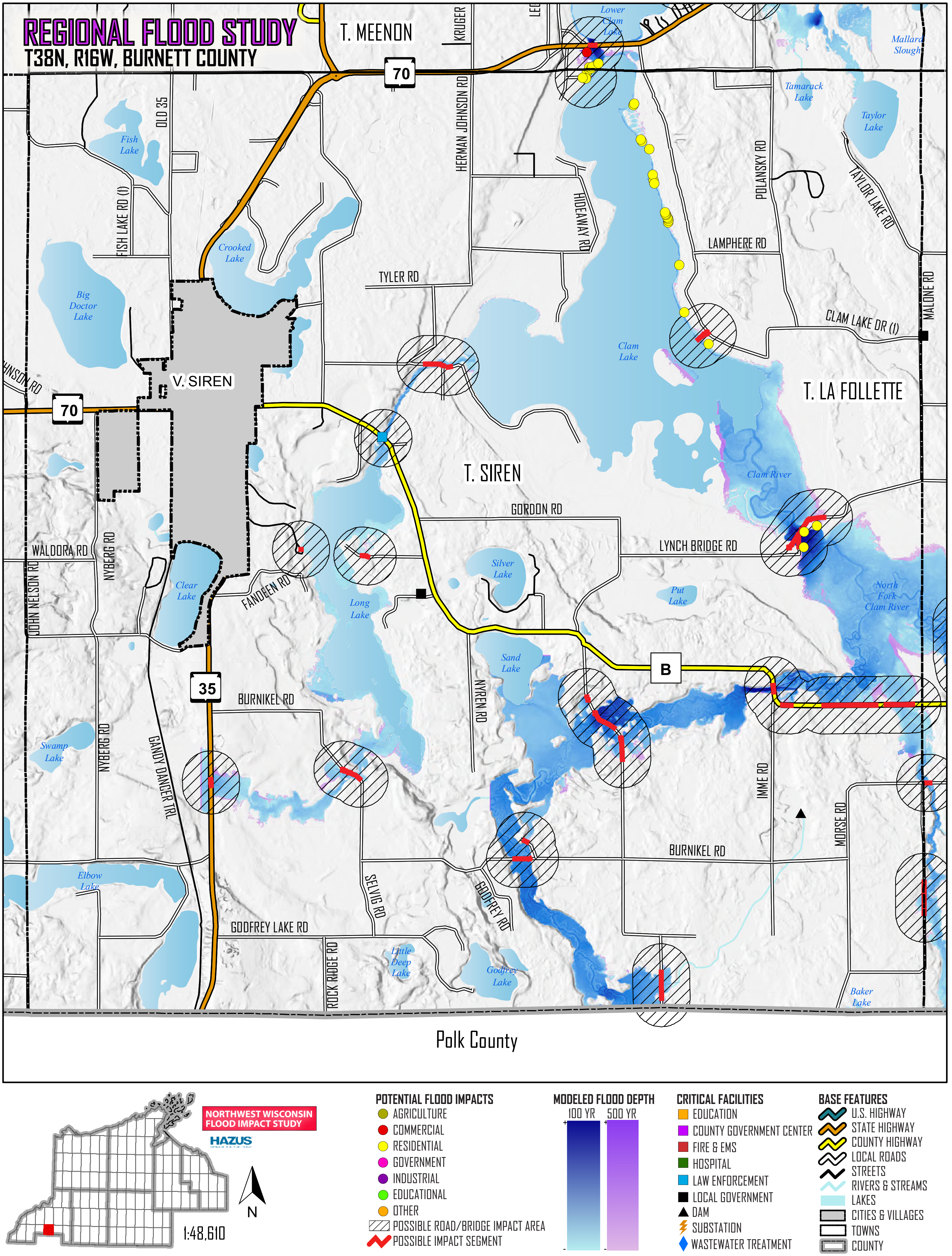

REGIONAL FLOOD STUDY
T38N, R17W, BURNETT COUNTY
T. LINCOLN
T. WEST MARSHLAND
T. DANIELS
Polk County
BJORKLUND RD
OLSON RD
SPANGBERG RD
DANIEL JOHNSON RD
RANGE LINE RD
SHEARMAN RD
CHURCH RD
N MUD HEN LAKE RD
DANIELS 70 RD
TOLLANDER RD
WOOD CREEK RD
SWENSON RD
PETERSON RD
WALDORA RD
JOHN NELSON RD
KEMPF RD
FOSBERG RD
BLOMGREN RD
KOLANDER RD
CARLSON RD
ELBOW LAKE RD
VAN LOO RD
OLD 35
S EAST RD
COUNTY LINE RD
D
N
70
W
Blomberg Lake
Wilson Lake
North Fork Wood River
Mud Hen Lake
Big Doctor Lake
Doctor Lake
Indian Lake
Wood River
Dunham Lake
Little Dunham Lake
Ward Lake
Lind Lake
Swamp Lake
Little Wood Lake
Elbow Lake
Hunters Lake
Black Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:47,920
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T38N, R16W, BURNETT COUNTY
T. MEENON
T. SIREN
T. LA FOLLETTE
V. SIREN
Polk County
Lower Clam Lake
Clam Lake
Tamarack Lake
Taylor Lake
Mallard Slough
Fish Lake
Crooked Lake
Big Doctor Lake
Clear Lake
Long Lake
Silver Lake
Put Lake
Sand Lake
Swamp Lake
Elbow Lake
Little Deep Lake
Godfrey Lake
Baker Lake
Clam River
North Fork Clam River
70
35
B
KRUGER
HERMAN JOHNSON RD
HIDEAWAY RD
POLANSKY RD
TAYLOR LAKE RD
LAMPHERE RD
CLAM LAKE DR (1)
MALONE RD
TYLER RD
OLD 35
FISH LAKE RD (1)
GORDON RD
LYNCH BRIDGE RD
WALDORA RD
NYBERG RD
JOHN NELSON RD
FANDEEN RD
NYREN RD
BURNIKEL RD
GANDY DANCER TRL
IMME RD
MORSE RD
SELVIG RD
GODFREY RD
GODFREY LAKE RD
ROCK RIDGE RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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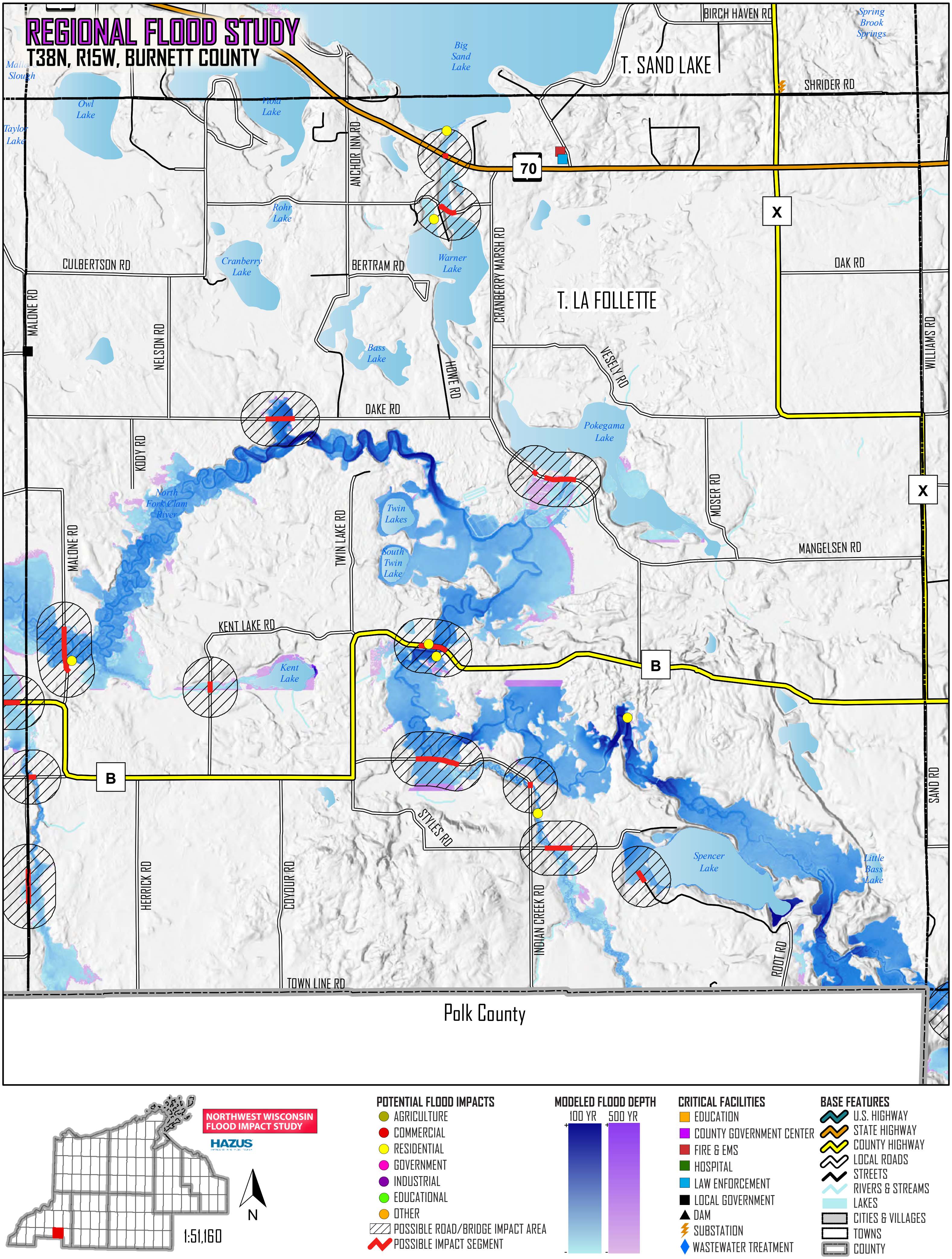
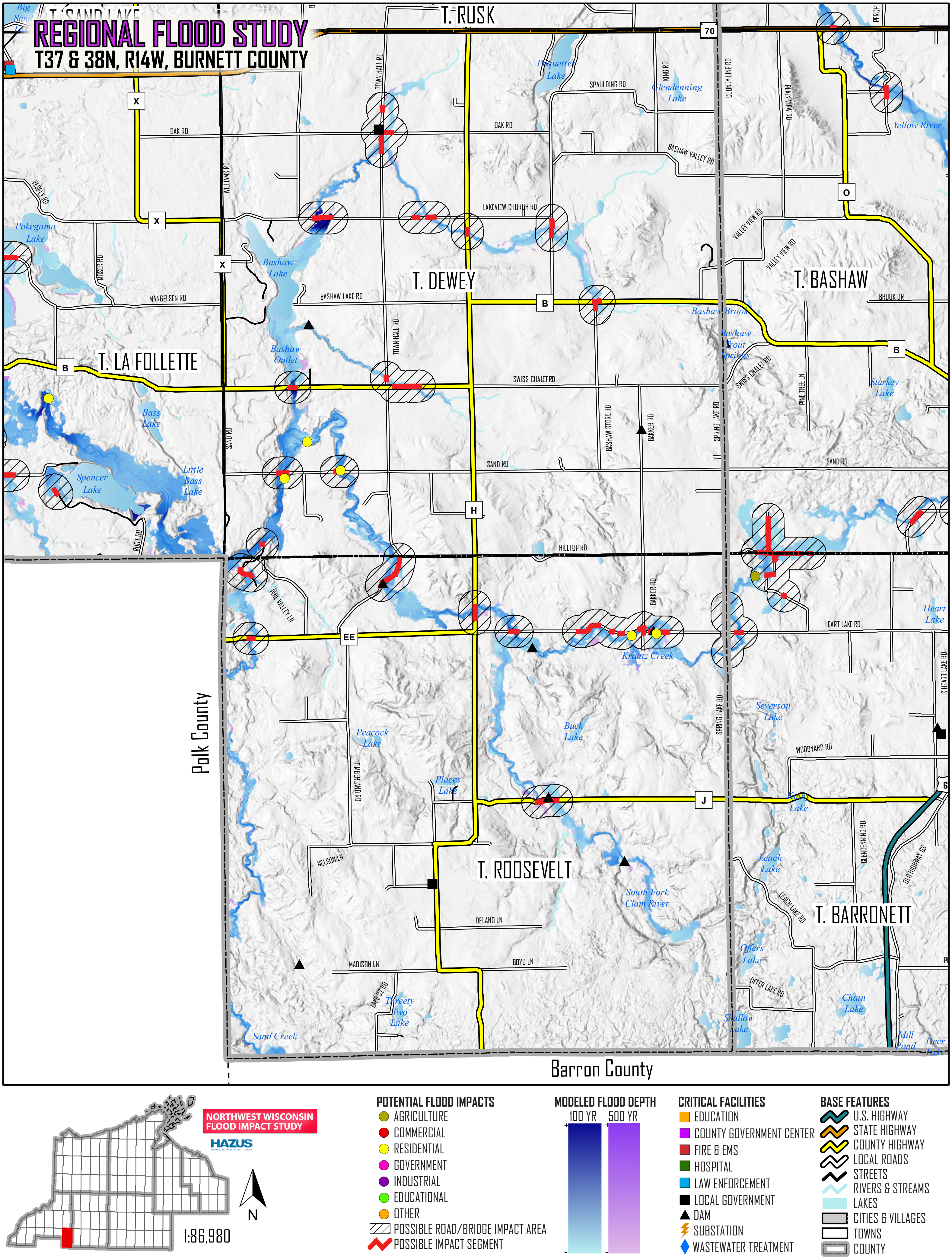
1:48,610
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T38N, R15W, BURNETT COUNTY
Big Sand Lake
T. SAND LAKE
BIRCH HAVEN RD
Spring Brook Springs
SHRIDER RD
Owl Lake
Viola Lake
Taylor Lake
ANCHOR INN RD
70
X
Rohr Lake
Cranberry Lake
Warner Lake
CULBERTSON RD
BERTRAM RD
CRANBERRY MARSH RD
OAK RD
T. LA FOLLETTE
MALONE RD
NELSON RD
Bass Lake
HOWE RD
VESELY RD
WILLIAMS RD
DAKE RD
Pokegama Lake
KODY RD
North Fork Clam River
MOSER RD
Twin Lakes
South Twin Lake
TWIN LAKE RD
MANGELSEN RD
KENT LAKE RD
Kent Lake
B
HERRICK RD
COYOUR RD
STYLES RD
INDIAN CREEK RD
Spencer Lake
Little Bass Lake
SAND RD
ROOT RD
TOWN LINE RD
Polk County
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:51,160
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T37 & 38N, R14W, BURNETT COUNTY
T. SAND LAKE
T. RUSK
T. DEWEY
T. BASHAW
T. LA FOLLETTE
T. ROOSEVELT
T. BARRONETT
Polk County
Barron County
Pokegama Lake
Bashaw Lake
Bashaw Outlet
Bass Lake
Spencer Lake
Little Bass Lake
Piquette Lake
Clendenning Lake
Yellow River
Bashaw Brook
Bashaw Trout Springs
Starkey Lake
Heart Lake
Krantz Creek
Severson Lake
Buck Lake
Peacock Lake
Places Lake
South Fork Clam River
Leach Lake
Offers Lake
Chain Lake
Shallow Lake
Twenty Two Lake
Sand Creek
Mill Pond
Deer Lake
OAK RD
MANGELSEN RD
BASHAW LAKE RD
SWISS CHALET RD
SAND RD
HILLTOP RD
HEART LAKE RD
WOODYARD RD
DELAND LN
BOYD LN
MADISON LN
NELSON LN
LAKEVIEW CHURCH RD
SPAULDING RD
BASHAW VALLEY RD
BROOK DR
TOWN HALL RD
WILLIAMS RD
SAND RD
BAKKER RD
BASHAW STORE RD
SPRING LAKE RD
PINE TREE LN
VALLEY VIEW RD
KING RD
COUNTY LINE RD
PLAINVIEW RD
PINE VALLEY LN
TIMBERLAND RD
GLENDENNING RD
OLD HIGHWAY 63
LEACH LAKE RD
OFFER LAKE RD
S HEART LAKE RD
MOSER RD
VESELY RD
LAKE 22 RD
70
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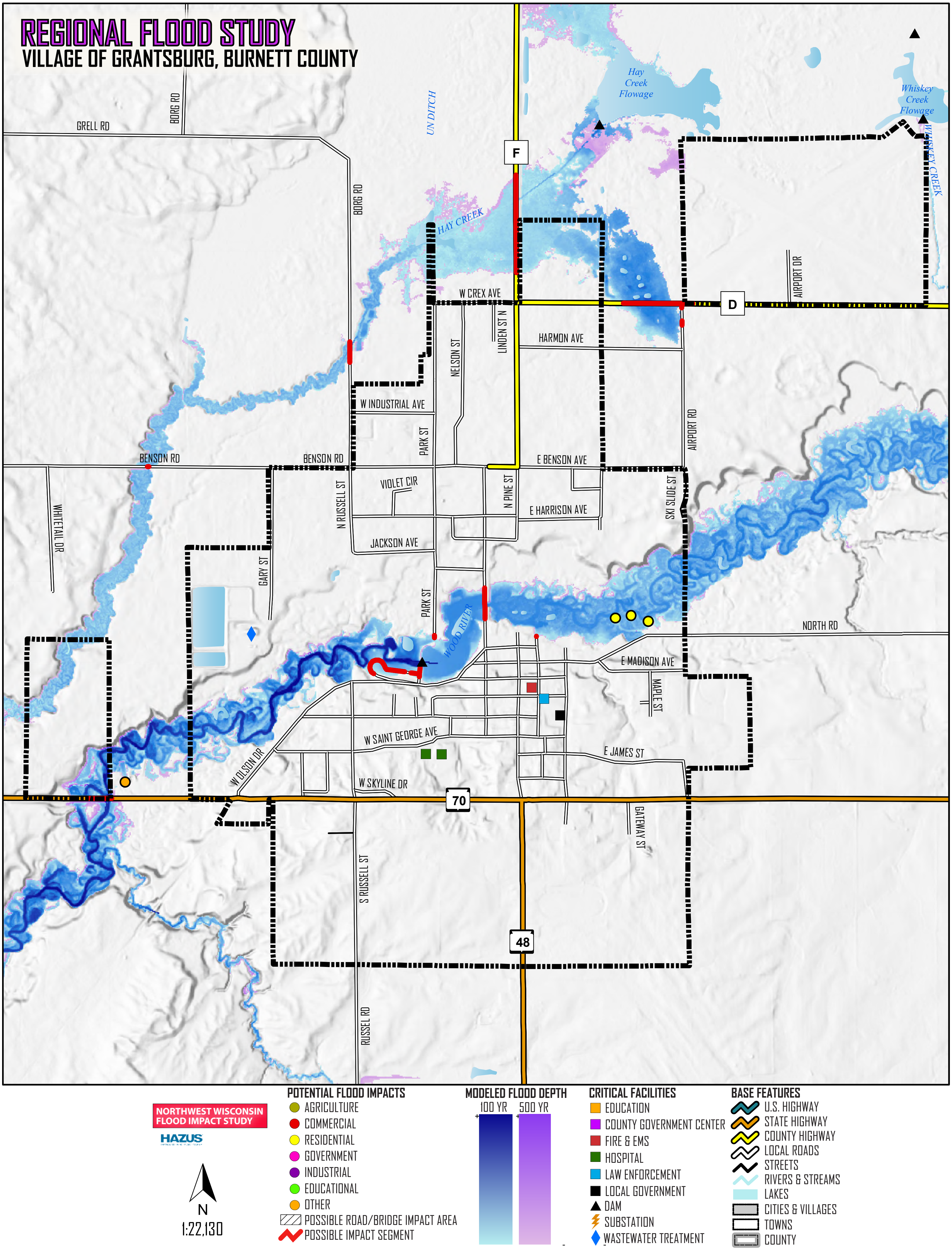
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,980



REGIONAL FLOOD STUDY
VILLAGE OF GRANTSBURG, BURNETT COUNTY
GRELL RD
BORG RD
UN DITCH
Hay Creek Flowage
Whiskey Creek Flowage
WHISKEY CREEK
HAY CREEK
F
D
W CREX AVE
LINDEN ST N
NELSON ST
HARMON AVE
AIRPORT DR
W INDUSTRIAL AVE
PARK ST
AIRPORT RD
BENSON RD
E BENSON AVE
VIOLET CIR
N RUSSELL ST
N PINE ST
E HARRISON AVE
SKI SLIDE ST
WHITETAIL DR
JACKSON AVE
GARY ST
WOOD RIVER
NORTH RD
E MADISON AVE
MAPLE ST
W SAINT GEORGE AVE
W OLSON DR
E JAMES ST
W SKYLINE DR
70
GATEWAY ST
S RUSSELL ST
48
RUSSEL RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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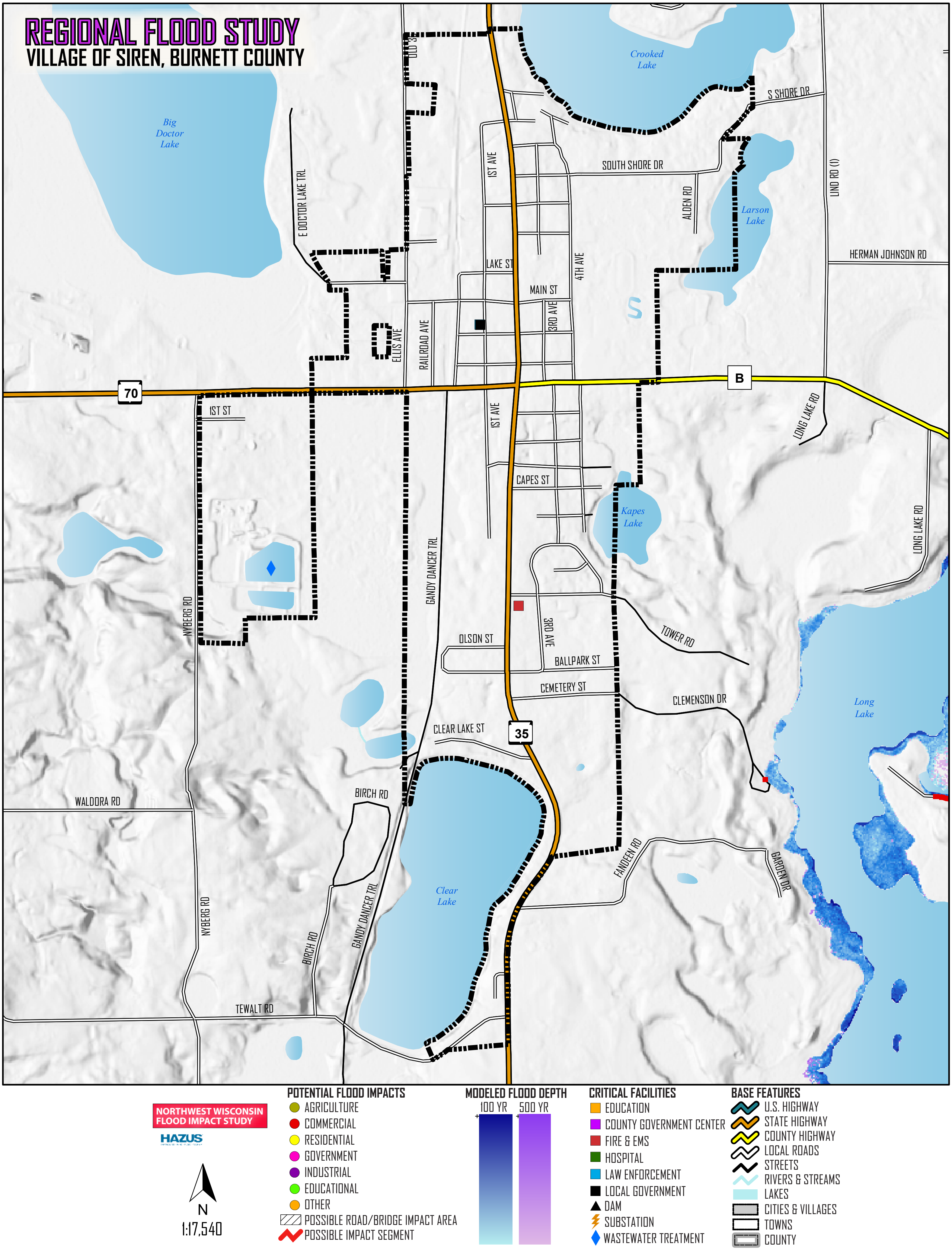
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF SIREN, BURNETT COUNTY
Big Doctor Lake
Crooked Lake
Larson Lake
Kapes Lake
Clear Lake
Long Lake
OLD 35
S SHORE DR
SOUTH SHORE DR
1ST AVE
ALDEN RD
LIND RD (I)
E DOCTOR LAKE TRL
HERMAN JOHNSON RD
LAKE ST
MAIN ST
4TH AVE
3RD AVE
ELLIS AVE
RAILROAD AVE
70
B
1ST ST
LONG LAKE RD
CAPES ST
GANDY DANCER TRL
NYBERG RD
TOWER RD
OLSON ST
BALLPARK ST
CEMETERY ST
CLEMENSON DR
CLEAR LAKE ST
35
BIRCH RD
WALDORA RD
FANDEEN RD
GARDEN DR
TEWALT RD
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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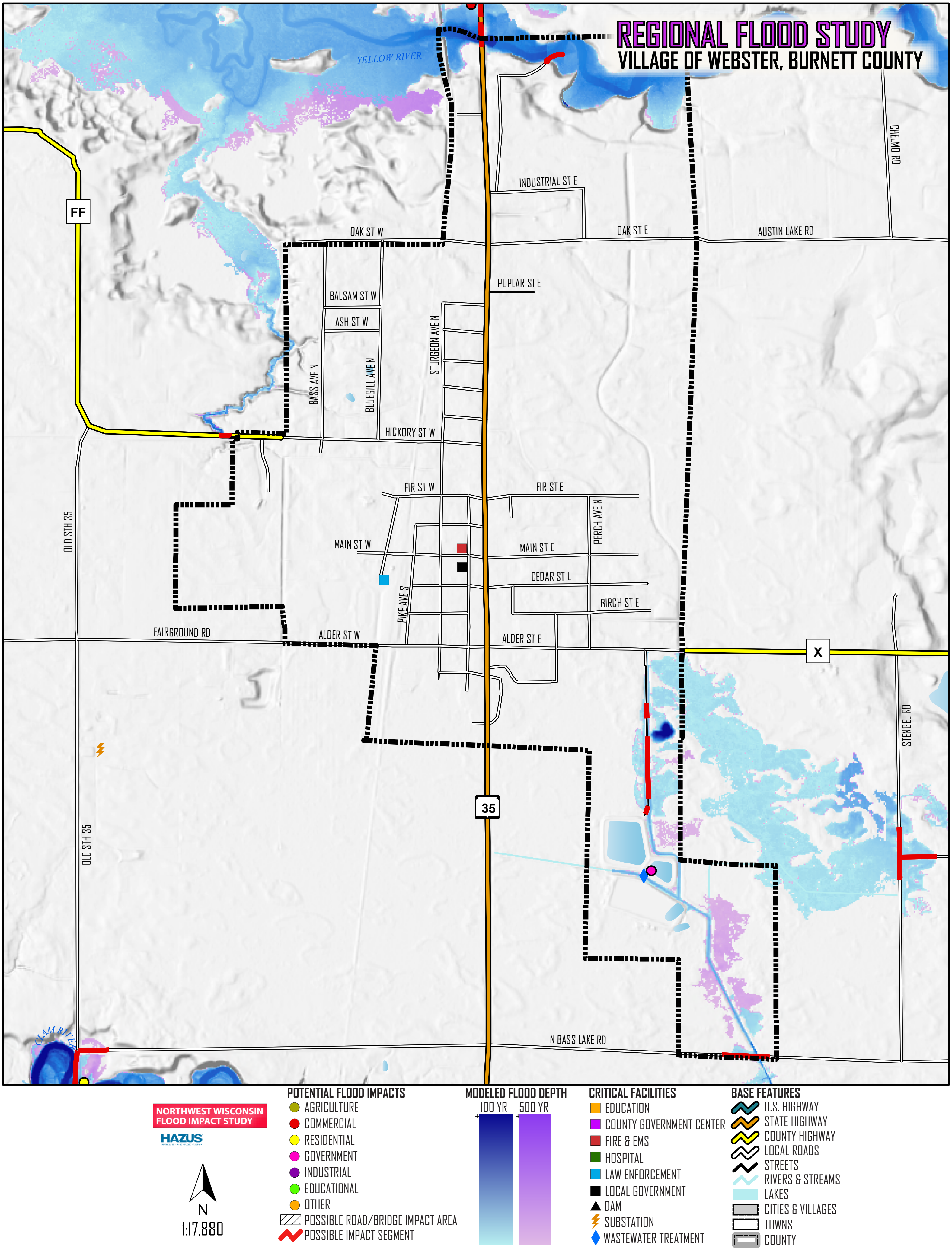
REGIONAL FLOOD STUDY
VILLAGE OF WEBSTER, BURNETT COUNTY
YELLOW RIVER
CLAM RIVER
FF
X
35
OAK ST W
OAK ST E
INDUSTRIAL ST E
AUSTIN LAKE RD
CHELMO RD
POPLAR ST E
BALSAM ST W
ASH ST W
BASS AVE N
BLUEGILL AVE N
STURGEON AVE N
HICKORY ST W
FIR ST W
FIR ST E
PERCH AVE N
MAIN ST W
MAIN ST E
CEDAR ST E
BIRCH ST E
PIKE AVE S
FAIRGROUND RD
ALDER ST W
ALDER ST E
OLD STH 35
STENGEL RD
N BASS LAKE RD
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN
FLOOD IMPACT STUDY
HAZUS
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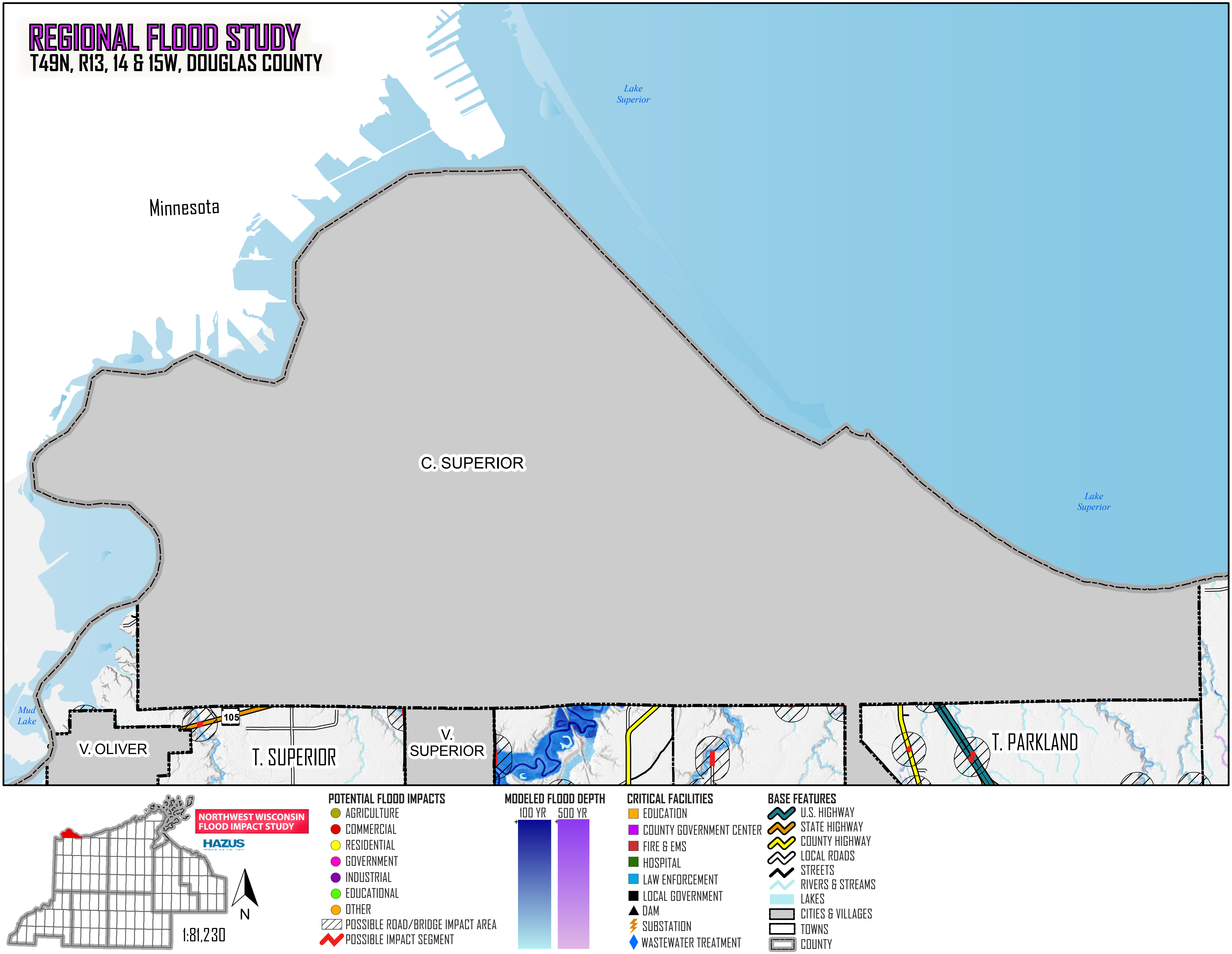
DOUGLAS COUNTY

HAZUS 100-YEAR FLOOD LOSS ESTIMATES - DOUGLAS COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF SUPERIOR	1	$ 6,921.00	$ 53,406.00	$ -	1
T. OF AMNICON	1	$ -	$ -	$ -	6
T. OF BRULE	4	$ 79,874.00	$ 28,370.00	$ -	48
T. OF CLOVERLAND	1	$ 12,280.00	$ 4,545.00	$ -	12
T. OF DAIRYLAND	2	$ 1,497.00	$ 204.00	$ -	11
T. OF GORDON	11	$ 148,401.00	$ 54,252.00	$ -	120
T. OF HAWTHORNE	2	$ 2,366.00	$ 328.00	$ -	7
T. OF HIGHLAND	9	$ 171,427.00	$ 291,975.00	$ -	61
T. OF LAKESIDE	5	$ 3,425.00	$ 1,354.00	$ -	33
T. OF OAKLAND	2	$ 1,224.00	$ 481.00	$ -	9
T. OF SOLON SPRINGS	7	$ 22,372.00	$ 13,894.00	$ -	42
T. OF SUPERIOR	1	$ 7,738.00	$ 44,091.00	$ -	2
T. OF WASCOTT	11	$ 121,747.00	$ 101,514.00	$ -	85
V. OF LAKE NEBAGAMON	2	$ 6,988.00	$ 4,493.00	$ -	12
V. OF SOLON SPRINGS	8	$ 58,319.00	$ 33,413.00	$ -	57
GRAND TOTAL	**67**	**$ 644,579.00**	**$ 632,320.00**	**$ -**	**506**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - DOUGLAS COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
T. OF AMNICON	5	$ 37,647.00	$ 12,569.00	$ -	52
T. OF BRULE	6	$ 125,417.00	$ 41,279.00	$ -	90
T. OF CLOVERLAND	1	$ 18,787.00	$ 6,224.00	$ -	12
T. OF DAIRYLAND	4	$ 19,836.00	$ 10,735.00	$ -	16
T. OF GORDON	20	$ 212,537.00	$ 76,255.00	$ -	232
T. OF HAWTHORNE	2	$ 3,540.00	$ 492.00	$ -	7
T. OF HIGHLAND	10	$ 205,229.00	$ 331,217.00	$ -	78
T. OF LAKESIDE	10	$ 124,559.00	$ 36,483.00	$ -	98
T. OF OAKLAND	4	$ 6,208.00	$ 2,427.00	$ -	16
T. OF SOLON SPRINGS	7	$ 29,223.00	$ 17,244.00	$ -	42
T. OF SUPERIOR	1	$ 3,627.00	$ 504.00	$ -	5
T. OF WASCOTT	18	$ 243,095.00	$ 91,206.00	$ -	217
V. OF LAKE NEBAGAMON	2	$ 12,224.00	$ 7,415.00	$ -	12
V. OF OLIVER	1	$ 1,465.00	$ 533.00	$ -	7
V. OF SOLON SPRINGS	8	$ 69,848.00	$ 40,444.00	$ -	57
GRAND TOTAL	**100**	**$ 1,120,682.00**	**$ 733,852.00**	**$ -**	**943**


REGIONAL FLOOD STUDY
T49N, R13, 14 & 15W, DOUGLAS COUNTY
Minnesota
Lake Superior
Lake Superior
C. SUPERIOR
Mud Lake
V. OLIVER
105
T. SUPERIOR
V. SUPERIOR
T. PARKLAND
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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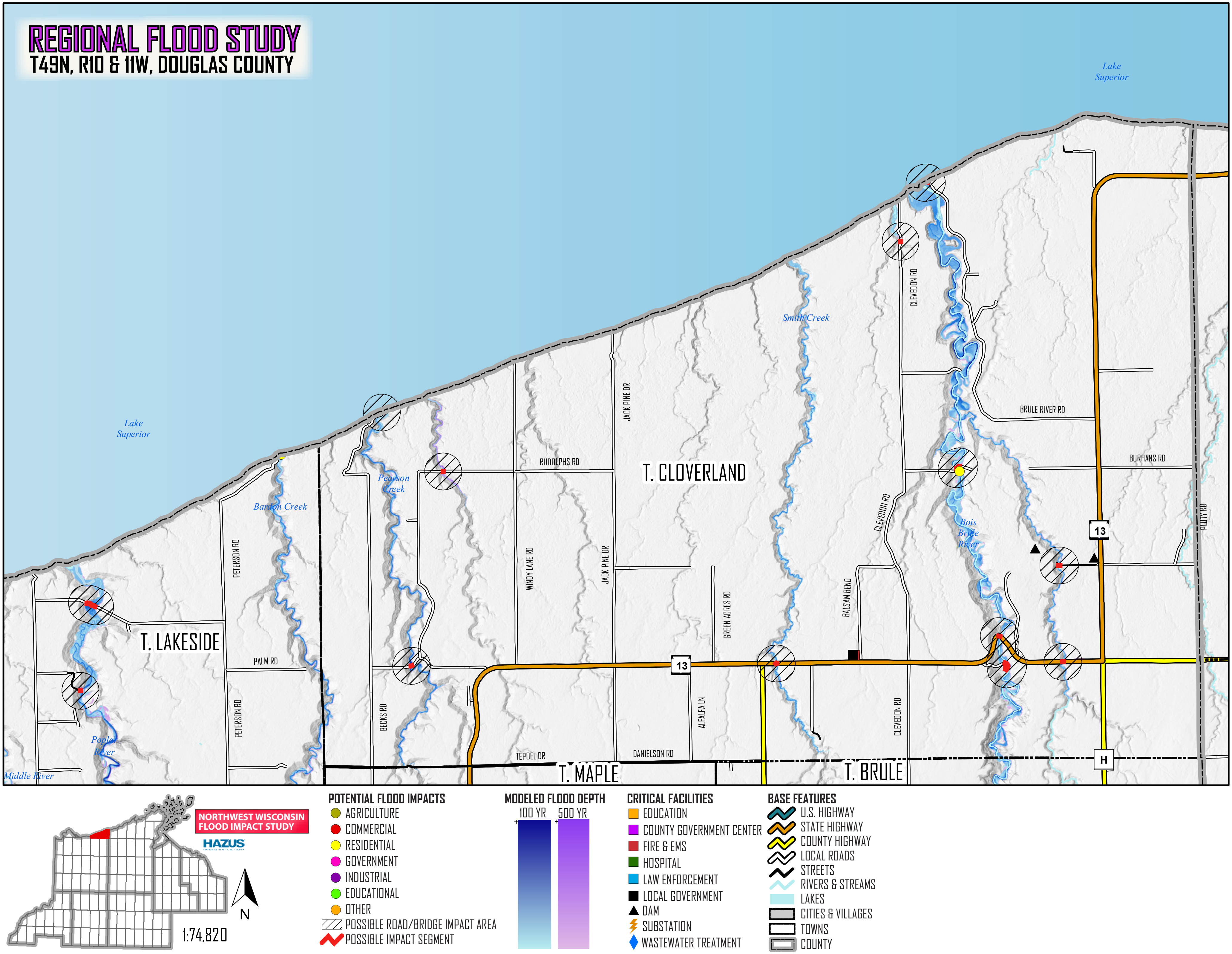
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T49N, R10 & 11W, DOUGLAS COUNTY
Lake Superior
Lake Superior
T. LAKESIDE
T. CLOVERLAND
T. MAPLE
T. BRULE
Bardon Creek
Pearson Creek
Smith Creek
Bois Brule River
Poplar River
Middle River
PETERSON RD
PALM RD
BECKS RD
RUDOLPHS RD
WINDY LANE RD
JACK PINE DR
TEPOEL DR
DANIELSON RD
ALFALFA LN
GREEN ACRES RD
BALSAM BEND
CLEVEDON RD
BRULE RIVER RD
BURHANS RD
PLUTY RD
13
H
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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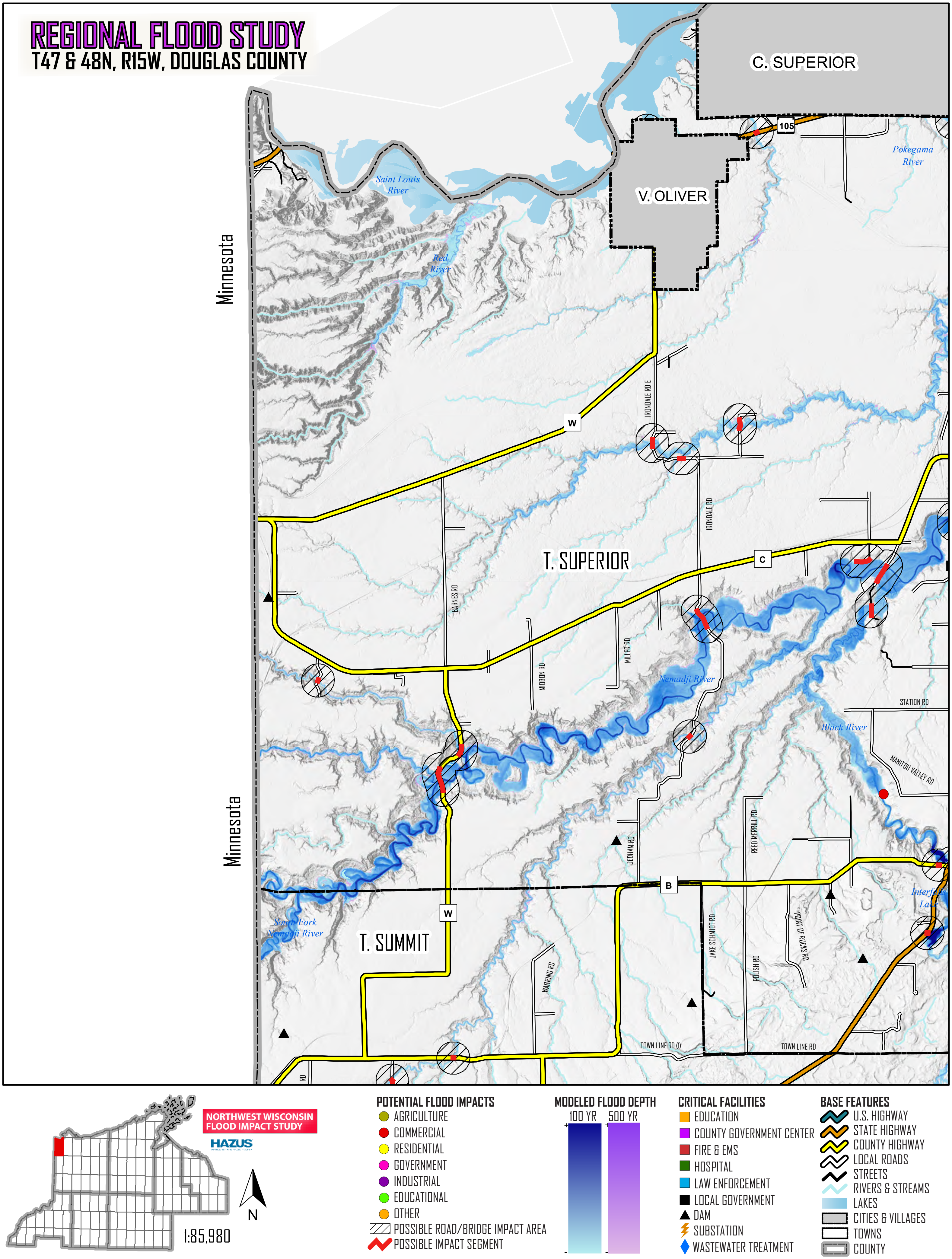
1:74,820
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T47 & 48N, R15W, DOUGLAS COUNTY
C. SUPERIOR
V. OLIVER
T. SUPERIOR
T. SUMMIT
Minnesota
Minnesota
Saint Louis River
Red River
Pokegama River
Nemadji River
Black River
South Fork Nemadji River
Interfalls Lake
105
W
C
B
IRONDALE RD E
IRONDALE RD
BARNES RD
MOBON RD
MILLER RD
STATION RD
MANITOU VALLEY RD
REED MERRILL RD
DEDHAM RD
JAKE SCHMIDT RD
POINT OF ROCKS RD
POLISH RD
WARRING RD
TOWN LINE RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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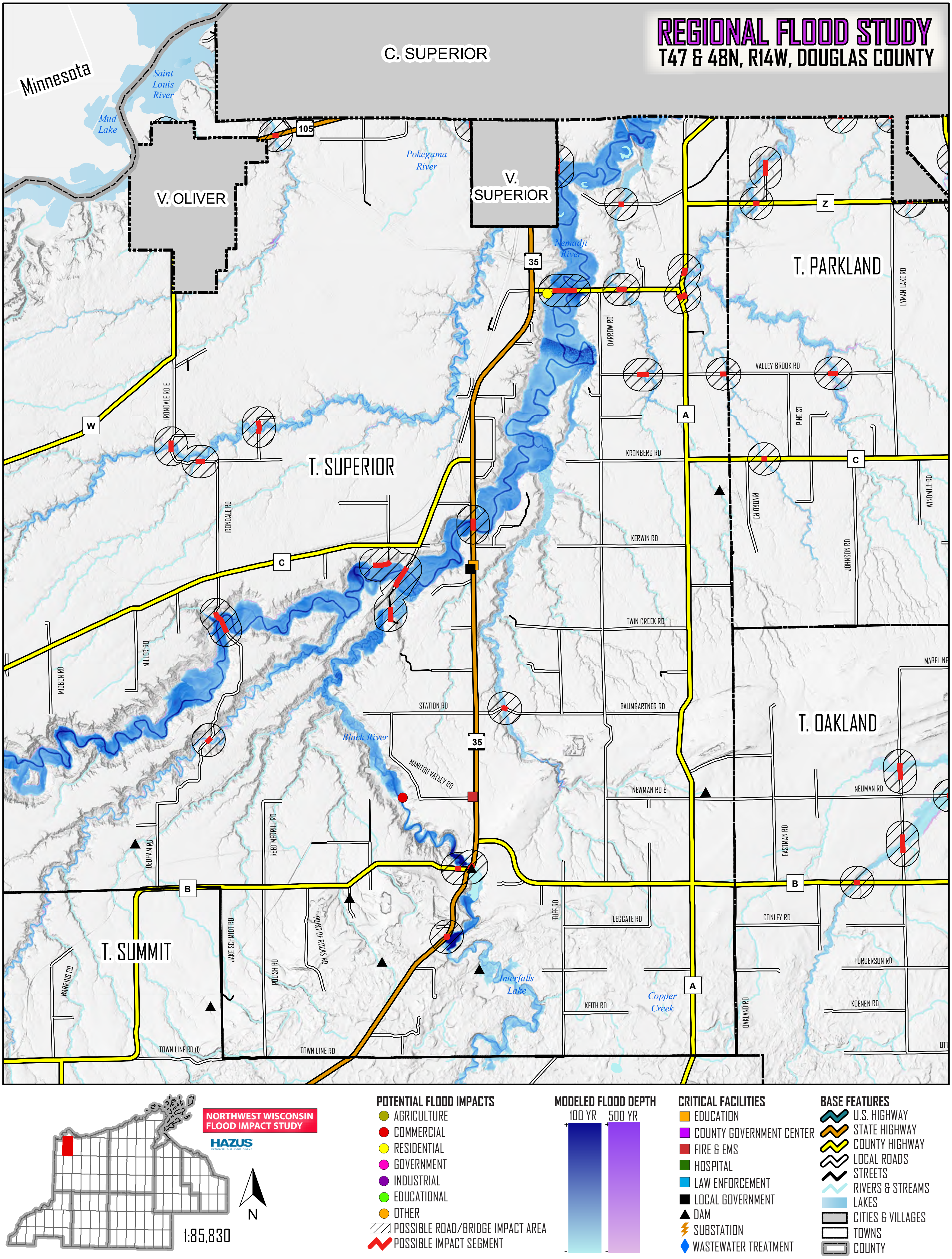
1:85,980
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T47 & 48N, R14W, DOUGLAS COUNTY
C. SUPERIOR
V. OLIVER
V. SUPERIOR
T. SUPERIOR
T. PARKLAND
T. OAKLAND
T. SUMMIT
Minnesota
Saint Louis River
Mud Lake
Pokegama River
Nemadji River
Black River
Interfalls Lake
Copper Creek
IRONDALE RD E
IRONDALE RD
MILLER RD
MIDBON RD
DEDHAM RD
REED MERRILL RD
JAKE SCHMIDT RD
POLISH RD
POINT OF ROCKS RD
WARRING RD
TOWN LINE RD (I)
TOWN LINE RD
STATION RD
MANITOU VALLEY RD
DARROW RD
KRONBERG RD
KERWIN RD
TWIN CREEK RD
BAUMGARTNER RD
NEWMAN RD E
LEGGATE RD
TUFF RD
KEITH RD
OAKLAND RD
VALLEY BROOK RD
PINE ST
RIVORD RD
JOHNSON RD
LYMAN LAKE RD
WINDMILL RD
MABEL NE
NEUMAN RD
EASTMAN RD
CONLEY RD
TORGERSON RD
KOENEN RD
105
35
W
C
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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COUNTY HIGHWAY
LOCAL ROADS
STREETS
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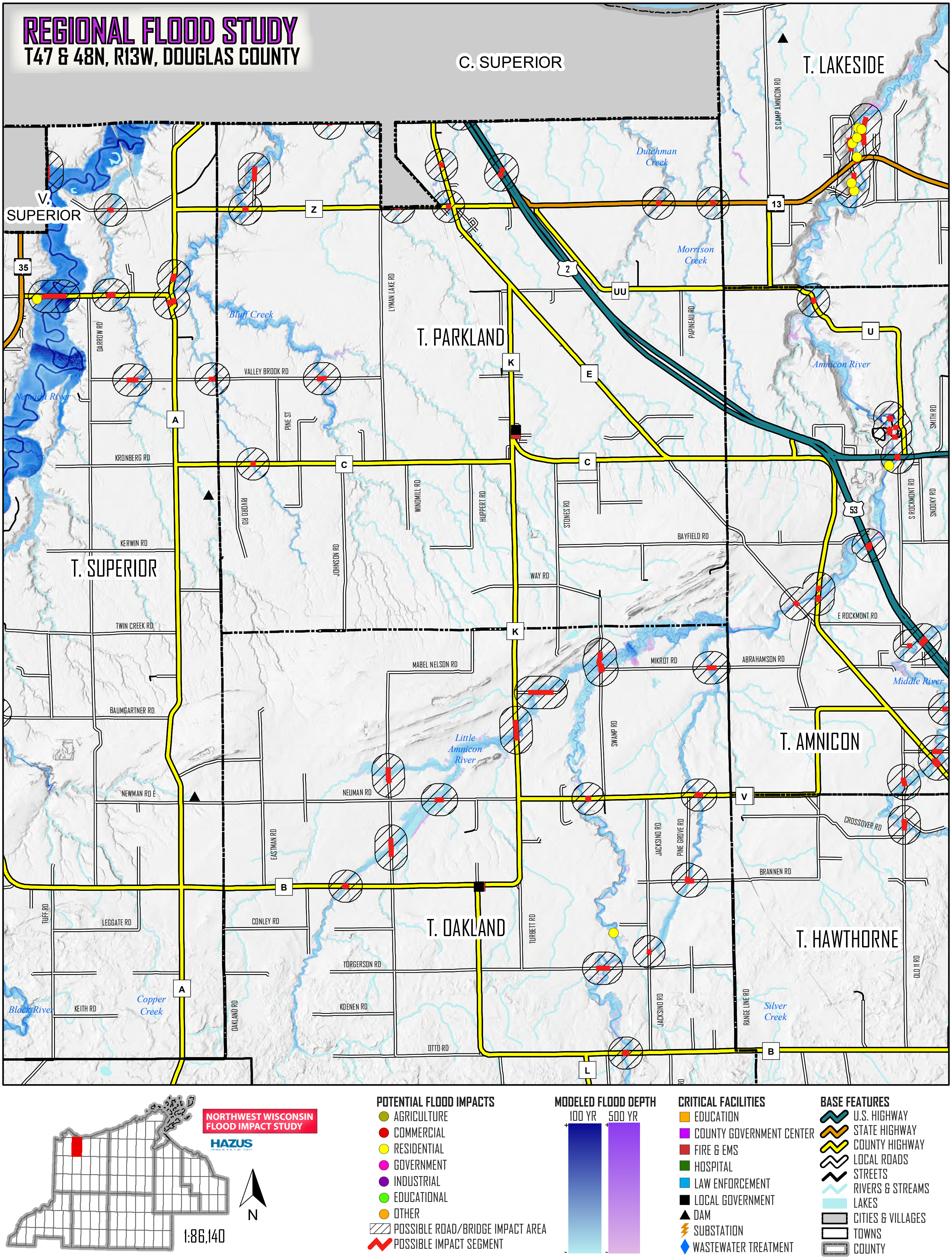
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T47 & 48N, R13W, DOUGLAS COUNTY
C. SUPERIOR
T. LAKESIDE
V. SUPERIOR
T. PARKLAND
T. SUPERIOR
T. AMNICON
T. OAKLAND
T. HAWTHORNE
Dutchman Creek
Morrison Creek
Bluff Creek
Amnicon River
Nemadji River
Little Amnicon River
Middle River
Copper Creek
Black River
Silver Creek
S CAMP AMNICON RD
DARROW RD
LYMAN LAKE RD
PAPINEAU RD
VALLEY BROOK RD
PINE ST
KRONBERG RD
RIVORD RD
WINDMILL RD
HUPPERT RD
STONES RD
JOHNSON RD
KERWIN RD
BAYFIELD RD
WAY RD
TWIN CREEK RD
E ROCKMONT RD
MABEL NELSON RD
MIKROT RD
ABRAHAMSON RD
BAUMGARTNER RD
SWAMP RD
NEWMAN RD E
NEUMAN RD
EASTMAN RD
JACKSINO RD
PINE GROVE RD
CROSSOVER RD
BRANNEN RD
TUFF RD
LEGGATE RD
CONLEY RD
TURBETT RD
TORGERSON RD
KEITH RD
OAKLAND RD
KOENEN RD
RANGE LINE RD
OLD 11 RD
OTTO RD
SMITH RD
S ROCKMONT RD
SNOOKY RD
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POTENTIAL FLOOD IMPACTS
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POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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CRITICAL FACILITIES
EDUCATION
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HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
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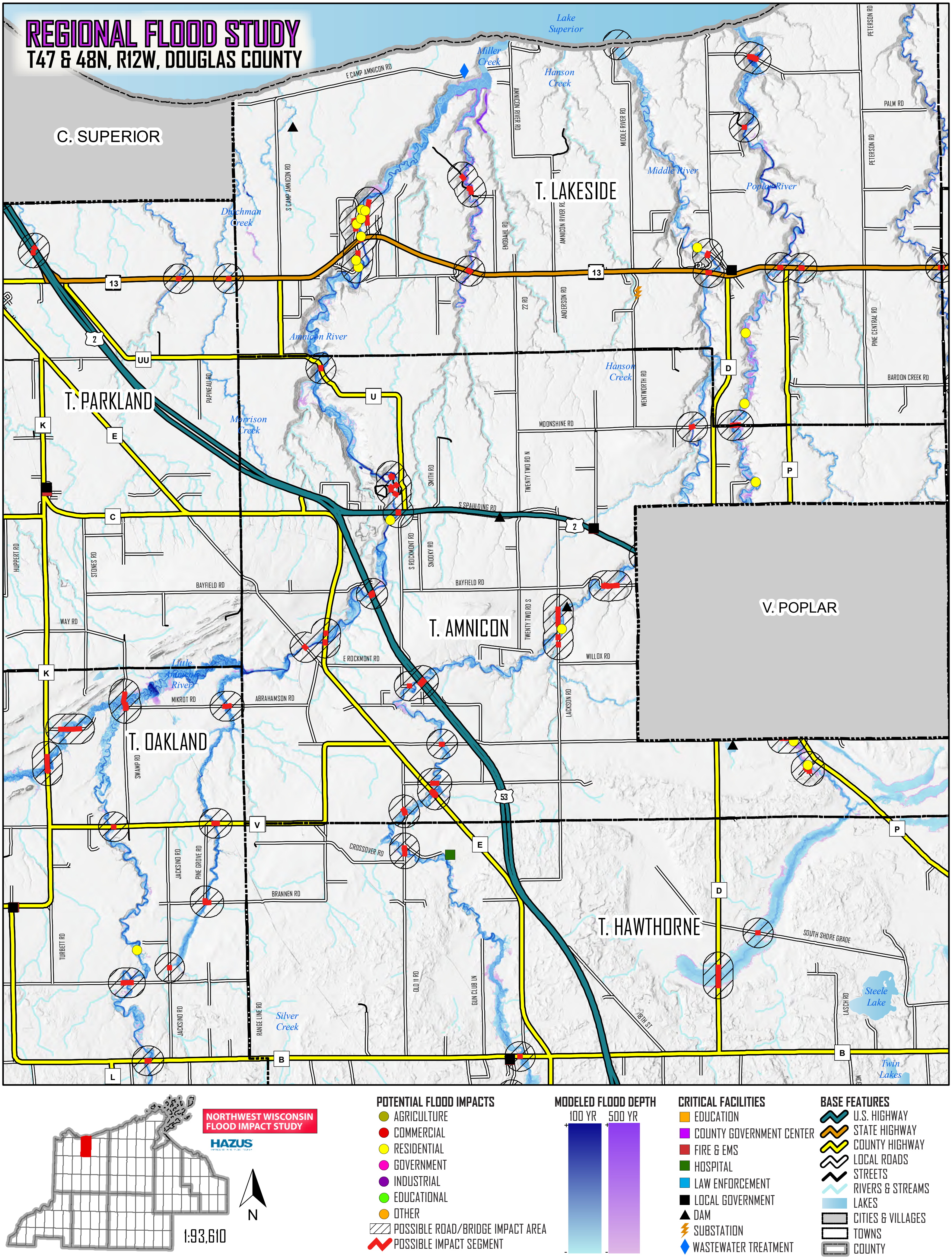

REGIONAL FLOOD STUDY
T47 & 48N, R12W, DOUGLAS COUNTY
Lake Superior
C. SUPERIOR
T. LAKESIDE
T. PARKLAND
T. AMNICON
V. POPLAR
T. OAKLAND
T. HAWTHORNE
Miller Creek
Hanson Creek
Middle River
Poplar River
Dutchman Creek
Amnicon River
Morrison Creek
Little Amnicon River
Silver Creek
Steele Lake
Twin Lakes
E CAMP AMNICON RD
S CAMP AMNICON RD
AMNICON RIVER RD
MIDDLE RIVER RD
PETERSON RD
PALM RD
PINE CENTRAL RD
BARDON CREEK RD
ENGDAHL RD
22 RD
ANDERSON RD
WENTWORTH RD
MOONSHINE RD
PAPINEAU RD
SMITH RD
TWENTY TWO RD N
S SPAULDING RD
S ROCKMONT RD
SNOOKY RD
BAYFIELD RD
TWENTY TWO RD S
WILLOX RD
LACKSON RD
E ROCKMONT RD
HUPPERT RD
STONES RD
WAY RD
MIKROT RD
ABRAHAMSON RD
SWAMP RD
CROSSOVER RD
JACKSINO RD
PINE GROVE RD
BRANNEN RD
TURBETT RD
RANGE LINE RD
OLD 11 RD
GUN CLUB LN
18TH ST
SOUTH SHORE GRADE
LASCH RD
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
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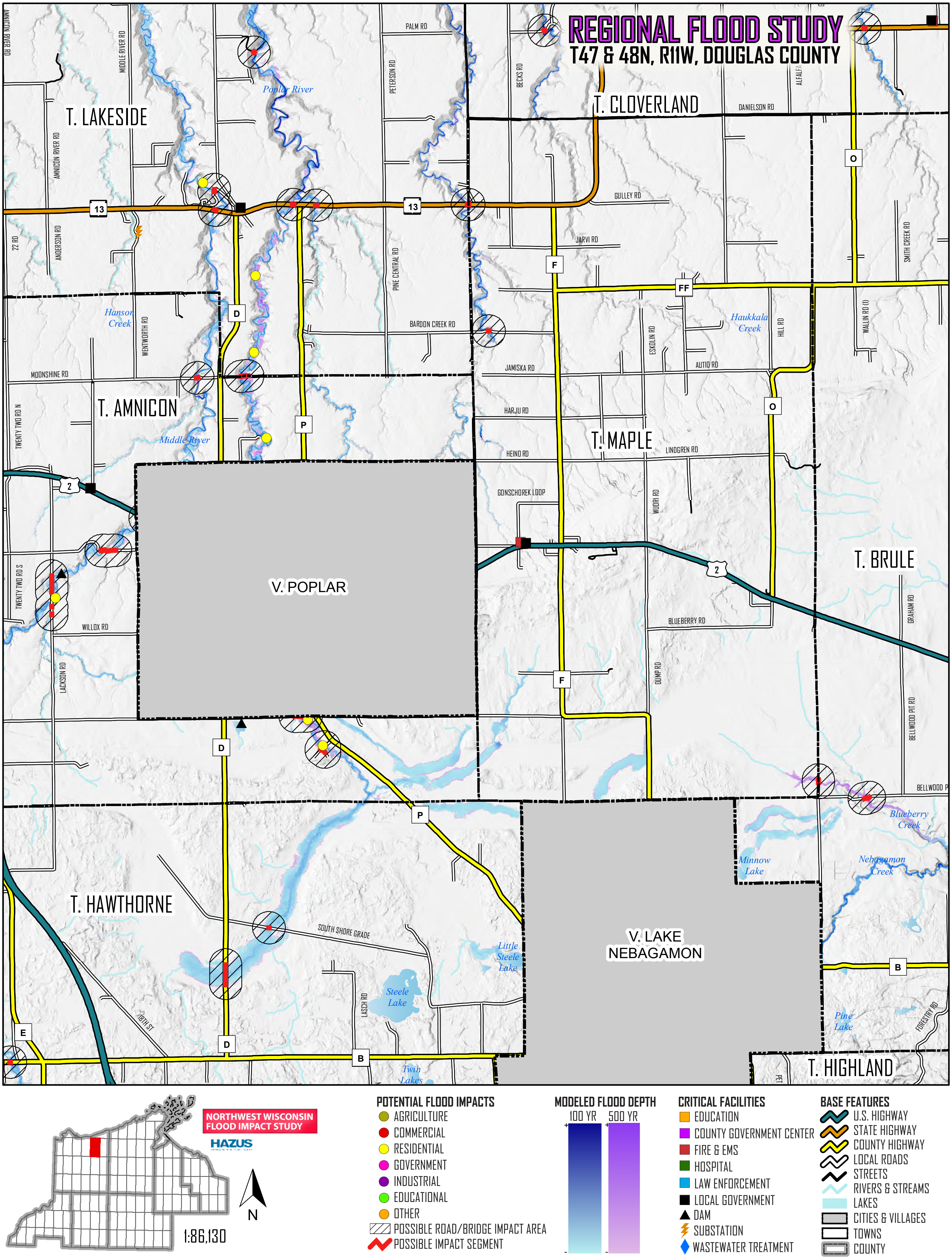

REGIONAL FLOOD STUDY
T47 & 48N, R11W, DOUGLAS COUNTY
T. LAKESIDE
T. CLOVERLAND
T. AMNICON
T. MAPLE
T. BRULE
V. POPLAR
T. HAWTHORNE
V. LAKE NEBAGAMON
T. HIGHLAND
Poplar River
Hanson Creek
Middle River
Haukkala Creek
Blueberry Creek
Minnow Lake
Nebagamon Creek
Little Steele Lake
Steele Lake
Pine Lake
Twin Lakes
AMNICON RIVER RD
MIDDLE RIVER RD
PALM RD
PETERSON RD
BECKS RD
ALFALFA
DANIELSON RD
AMNICON RIVER RD
ANDERSON RD
22 RD
GULLEY RD
JARVI RD
PINE CENTRAL RD
SMITH CREEK RD
WENTWORTH RD
BARDON CREEK RD
ESKOLIN RD
HILL RD
WALLIN RD (I)
MOONSHINE RD
JAMISKA RD
AUTIO RD
HARJU RD
TWENTY TWO RD N
HEINO RD
LINDGREN RD
GONSCHOREK LOOP
WUORI RD
TWENTY TWO RD S
WILLOX RD
BLUEBERRY RD
GRAHAM RD
LACKSON RD
DUMP RD
BELLWOOD PIT RD
BELLWOOD P
SOUTH SHORE GRADE
LASCH RD
FORESTRY RD
18TH ST
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
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GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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WASTEWATER TREATMENT
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U.S. HIGHWAY
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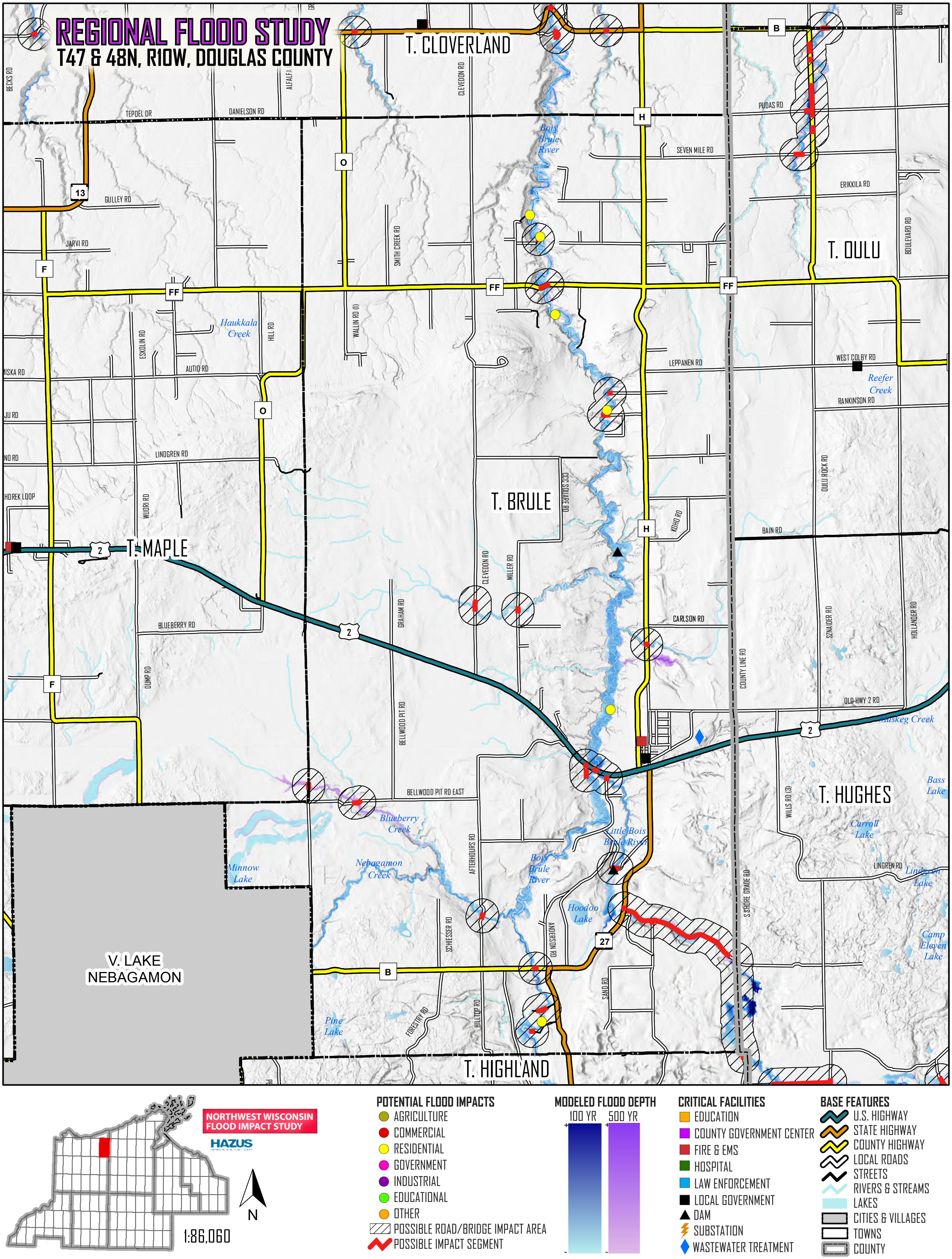
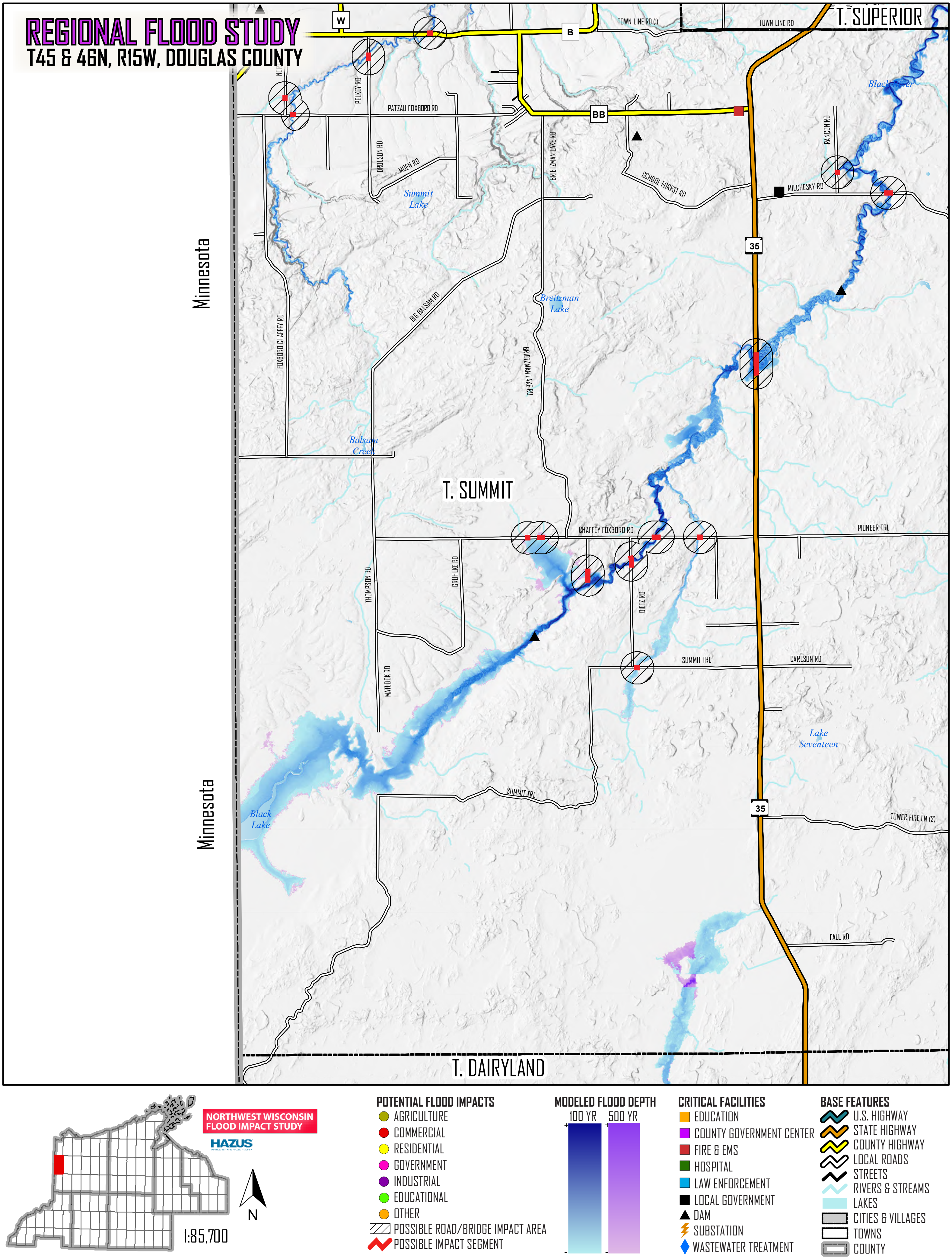
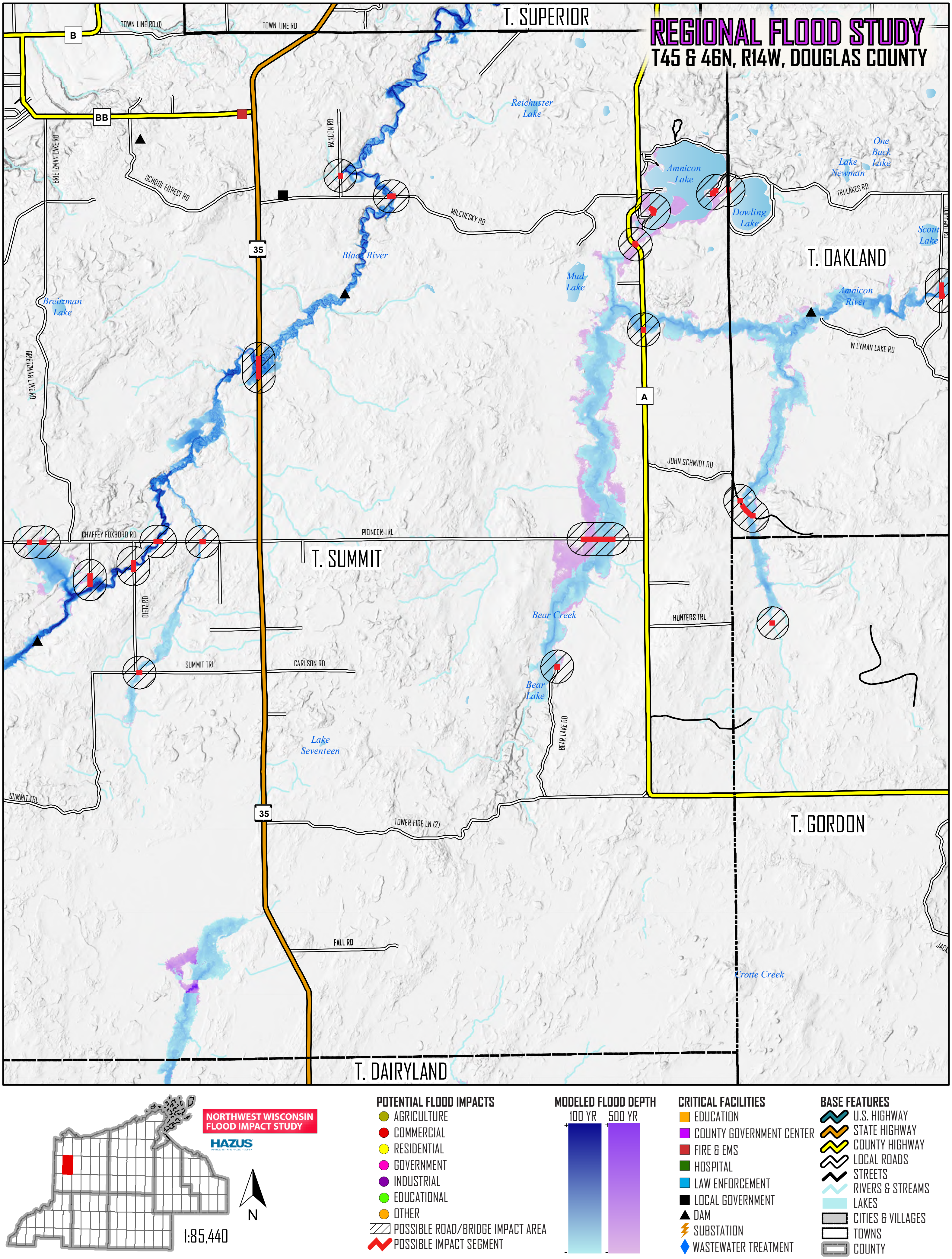
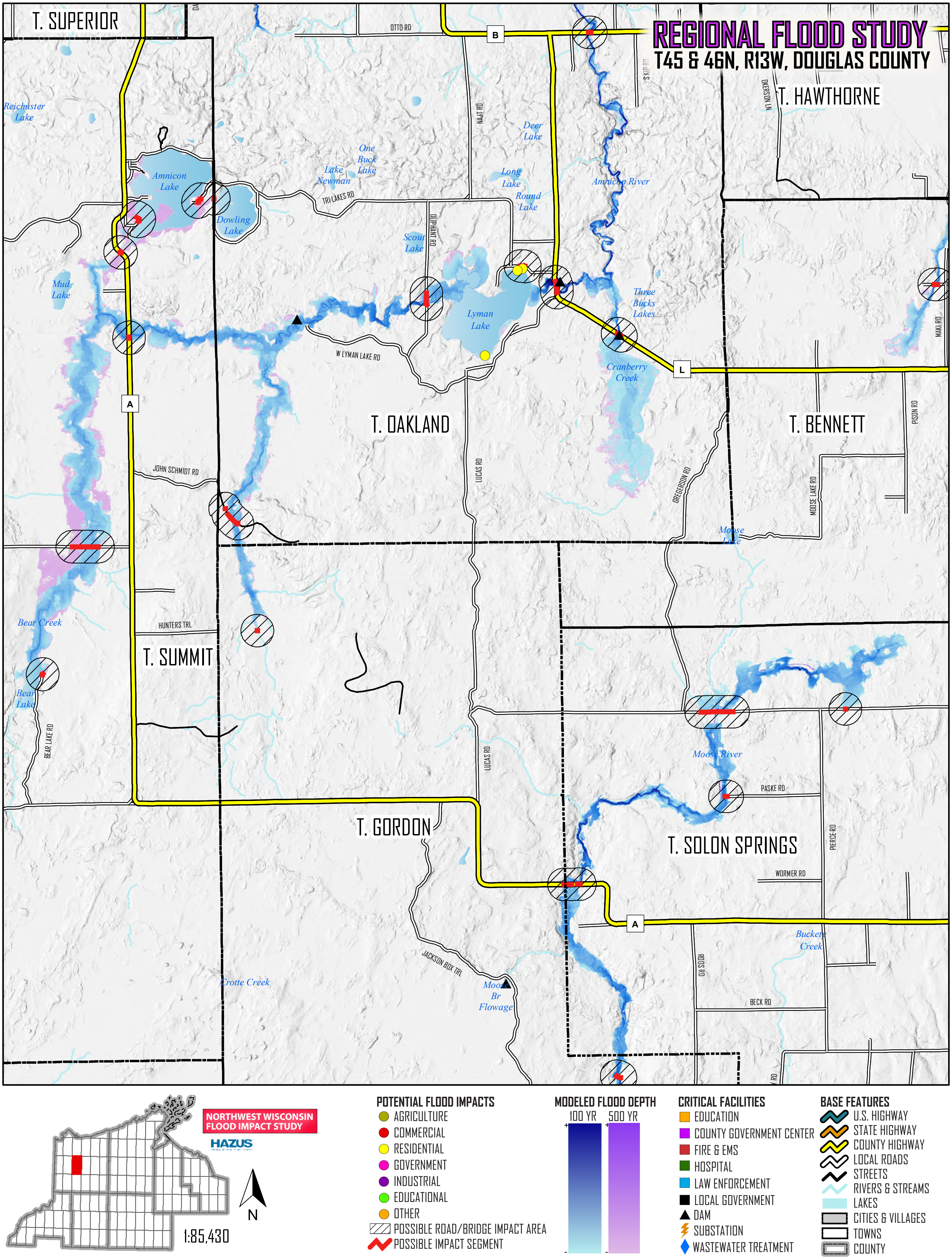
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,130


REGIONAL FLOOD STUDY
T47 & 48N, R10W, DOUGLAS COUNTY
T. CLOVERLAND
T. OULU
T. BRULE
T. MAPLE
T. HUGHES
T. HIGHLAND
V. LAKE NEBAGAMON
Bois Brule River
Haukkala Creek
Reefer Creek
Muskeg Creek
Blueberry Creek
Nebagamon Creek
Little Bois Brule River
Hoodoo Lake
Minnow Lake
Pine Lake
Bass Lake
Carroll Lake
Lindgren Lake
Camp Eleven Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,060
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T45 & 46N, R15W, DOUGLAS COUNTY
T. SUPERIOR
T. SUMMIT
T. DAIRYLAND
Minnesota
Minnesota
TOWN LINE RD (2)
TOWN LINE RD
PATZAU FOXBORO RD
PELKEY RD
OROLSON RD
MOEN RD
BRIETZMAN LAKE RD
SCHOOL FOREST RD
MILCHESKY RD
RANCON RD
Black River
Summit Lake
Breitzman Lake
BIG BALSAM RD
FOXBORO CHAFFEY RD
Balsam Creek
CHAFFEY FOXBORO RD
PIONEER TRL
GRUHLKE RD
THOMPSON RD
DIETZ RD
SUMMIT TRL
CARLSON RD
MATLOCK RD
Lake Seventeen
Black Lake
SUMMIT TRL
TOWER FIRE LN (2)
FALL RD
W
B
BB
35
35
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,700
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T45 & 46N, R14W, DOUGLAS COUNTY
T. SUPERIOR
T. OAKLAND
T. SUMMIT
T. GORDON
T. DAIRYLAND
TOWN LINE RD (1)
TOWN LINE RD
B
BB
35
A
SCHOOL FOREST RD
RANCON RD
MILCHESKY RD
TRI LAKES RD
BRIETZMAN LAKE RD
CHAFFEY FOXBORO RD
PIONEER TRL
JOHN SCHMIDT RD
W LYMAN LAKE RD
HUNTERS TRL
DIETZ RD
SUMMIT TRL
CARLSON RD
BEAR LAKE RD
TOWER FIRE LN (2)
FALL RD
Reichuster Lake
Amnicon Lake
Dowling Lake
Lake Newman
One Buck Lake
Scout Lake
Mud Lake
Black River
Amnicon River
Breitzman Lake
Bear Creek
Bear Lake
Lake Seventeen
Crotte Creek
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,440
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T45 & 46N, R13W, DOUGLAS COUNTY
T. SUPERIOR
T. HAWTHORNE
T. OAKLAND
T. BENNETT
T. SUMMIT
T. GORDON
T. SOLON SPRINGS
Reichuster Lake
Amnicon Lake
Dowling Lake
Lake Newman
One Buck Lake
Deer Lake
Long Lake
Round Lake
Scout Lake
Lyman Lake
Amnicon River
Three Bucks Lakes
Cranberry Creek
Mud Lake
Moose Lake
Bear Creek
Bear Lake
Moose River
Buckety Creek
Crotte Creek
Moose Br Flowage
OTTO RD
TRI LAKES RD
W LYMAN LAKE RD
JOHN SCHMIDT RD
HUNTERS TRL
LUCAS RD
OLIPHANT RD
NAJT RD
GREGERSON RD
MOOSE LAKE RD
PISON RD
MAKI RD
PASKE RD
WORMER RD
PIERCE RD
RODS RD
BECK RD
JACKSON BOX TRL
BEAR LAKE RD
A
B
L
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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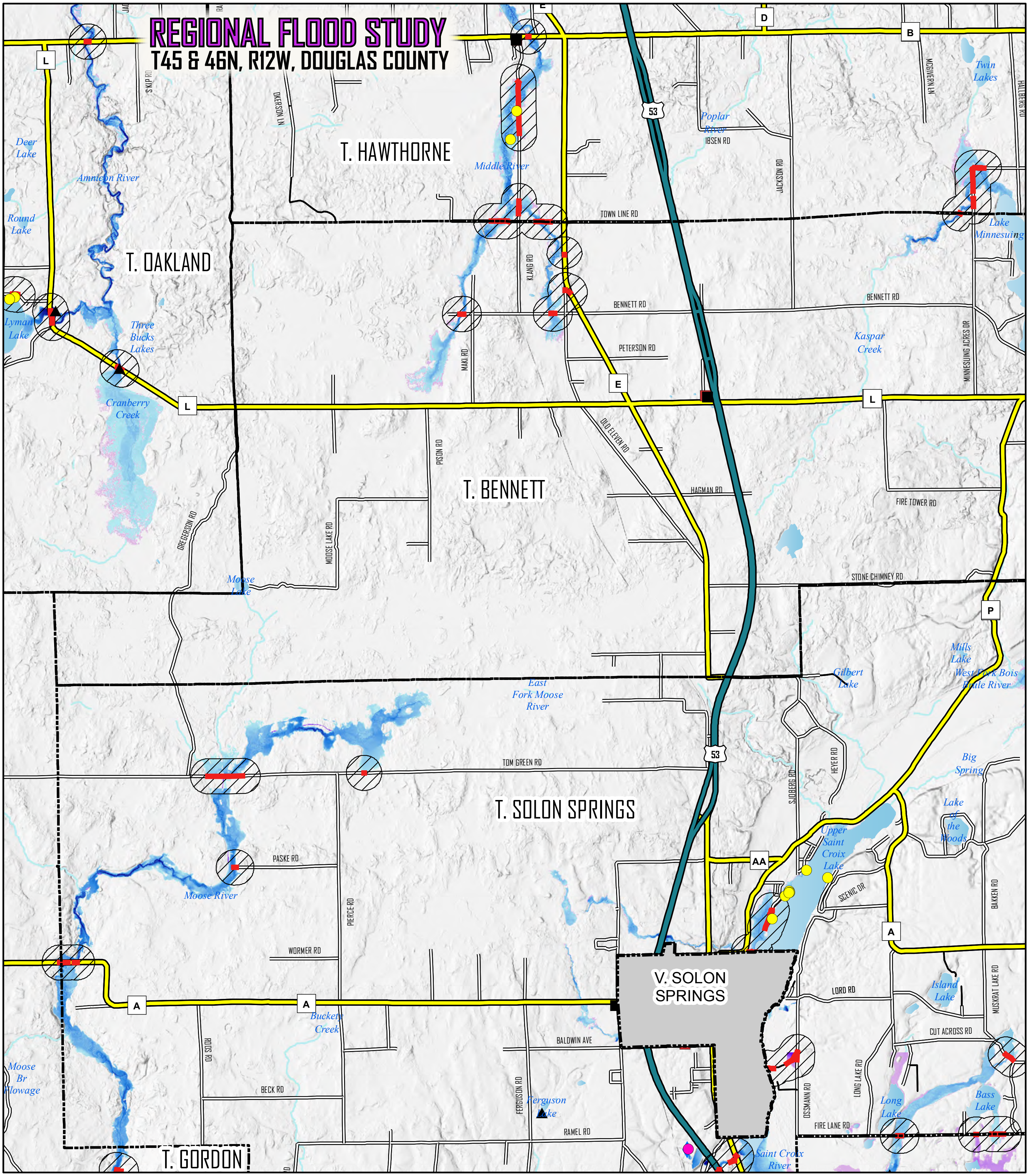


POTENTIAL FLOOD IMPACTS

- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH

100 YR | 500 YR

+

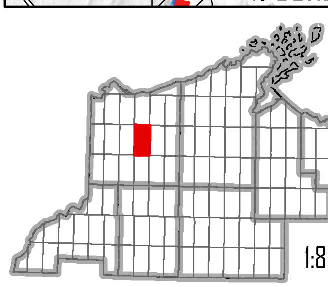
-

CRITICAL FACILITIES

- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES

- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



NORTHWEST WISCONSIN FLOOD IMPACT STUDY

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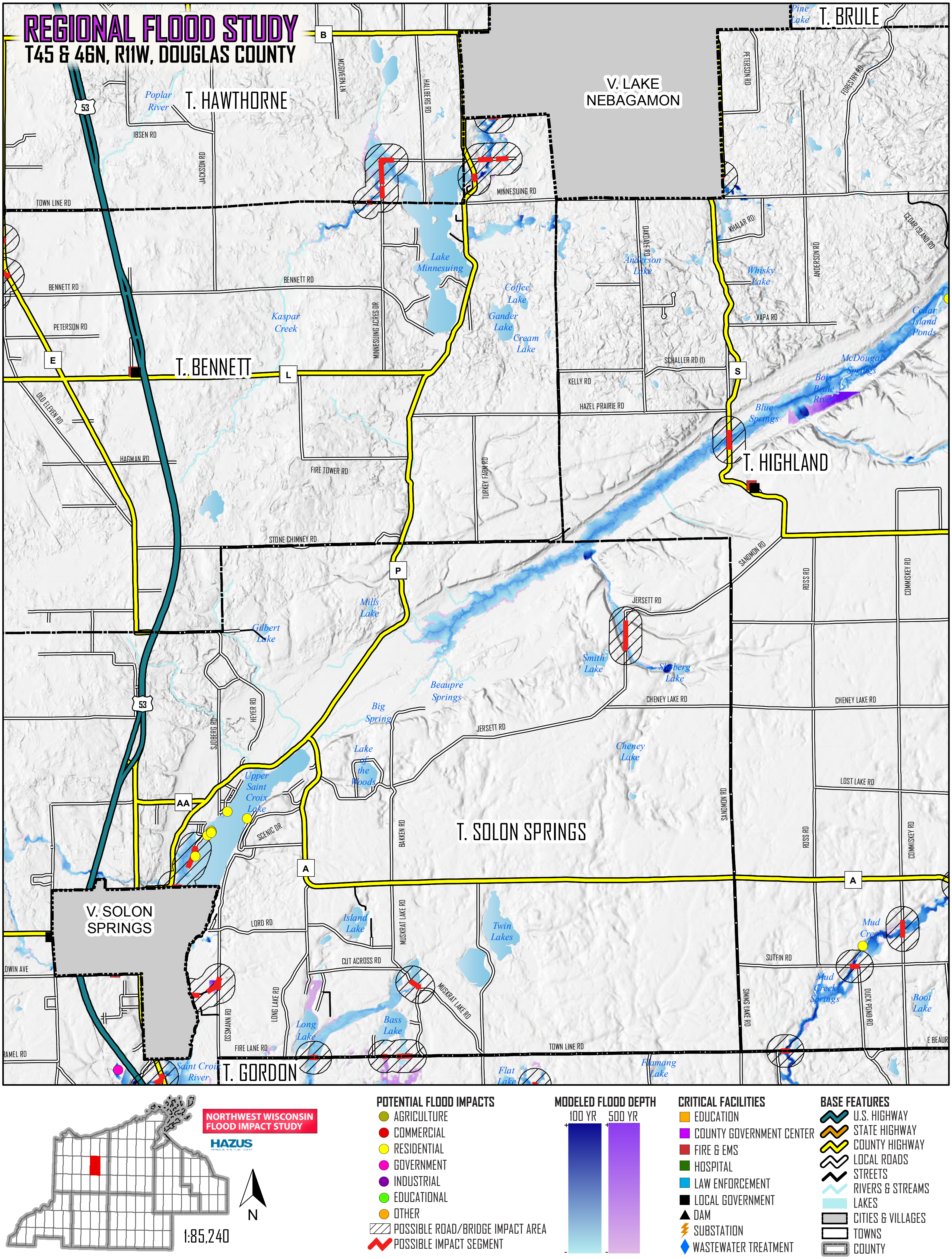
REGIONAL FLOOD STUDY
T45 & 46N, R11W, DOUGLAS COUNTY
T. HAWTHORNE
V. LAKE NEBAGAMON
T. BRULE
T. BENNETT
T. HIGHLAND
T. SOLON SPRINGS
V. SOLON SPRINGS
T. GORDON
Poplar River
Lake Minnesuing
Coffee Lake
Gander Lake
Cream Lake
Kaspar Creek
Anderson Lake
Whisky Lake
Pine Lake
Cedar Island Ponds
McDougal Springs
Bois Brule River
Blue Springs
Mills Lake
Gilbert Lake
Smith Lake
Sjoberg Lake
Beaupre Springs
Big Spring
Lake of the Woods
Cheney Lake
Upper Saint Croix Lake
Island Lake
Twin Lakes
Long Lake
Bass Lake
Flat Lake
Flamang Lake
Mud Creek
Mud Creek Springs
Boot Lake
Saint Croix River
TOWN LINE RD
BENNETT RD
PETERSON RD
IBSEN RD
JACKSON RD
MCGOVERN LN
HALLBERG RD
MINNESUING RD
MINNESUING ACRES DR
PETERSON RD
FORESTRY RD
KHALAR RD
CEDAR ISLAND RD
OAKDALE RD
ANDERSON RD
VAPA RD
SCHALLER RD (I)
KELLY RD
HAZEL PRAIRIE RD
OLD ELEVEN RD
HAGMAN RD
FIRE TOWER RD
TURKEY FARM RD
STONE CHIMNEY RD
SANDMON RD
ROSS RD
COMMISKEY RD
JERSETT RD
CHENEY LAKE RD
SJOBERG RD
HEYER RD
SCENIC DR
BAKKEN RD
LOST LAKE RD
SANDMON RD
LORD RD
CUT ACROSS RD
MUSKRAT LAKE RD
LONG LAKE RD
OSSMANN RD
FIRE LANE RD
TOWN LINE RD
SUTFIN RD
SIMMS LAKE RD
DUCK POND RD
E BEAUR
DWIN AVE
RAMEL RD
53
B
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
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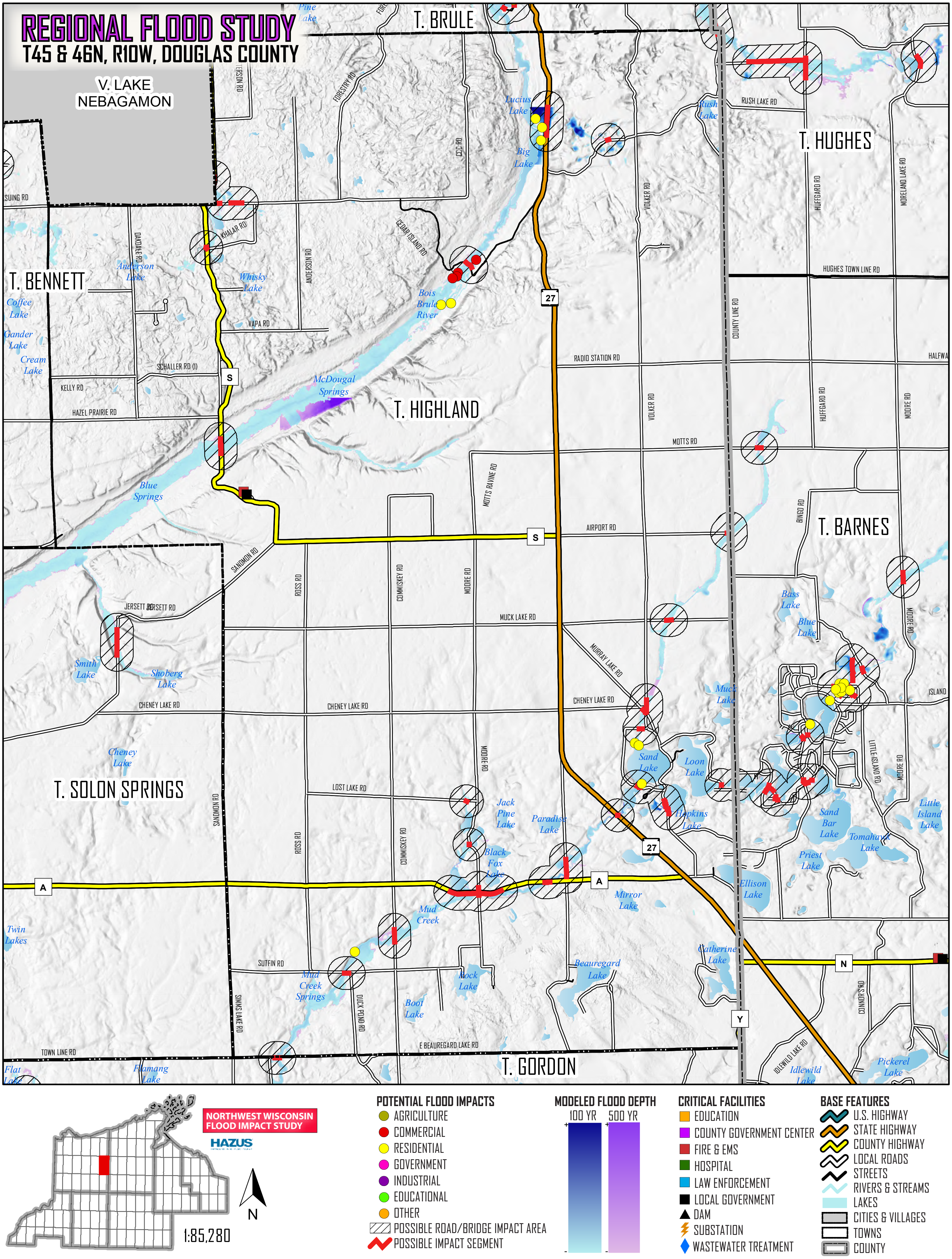
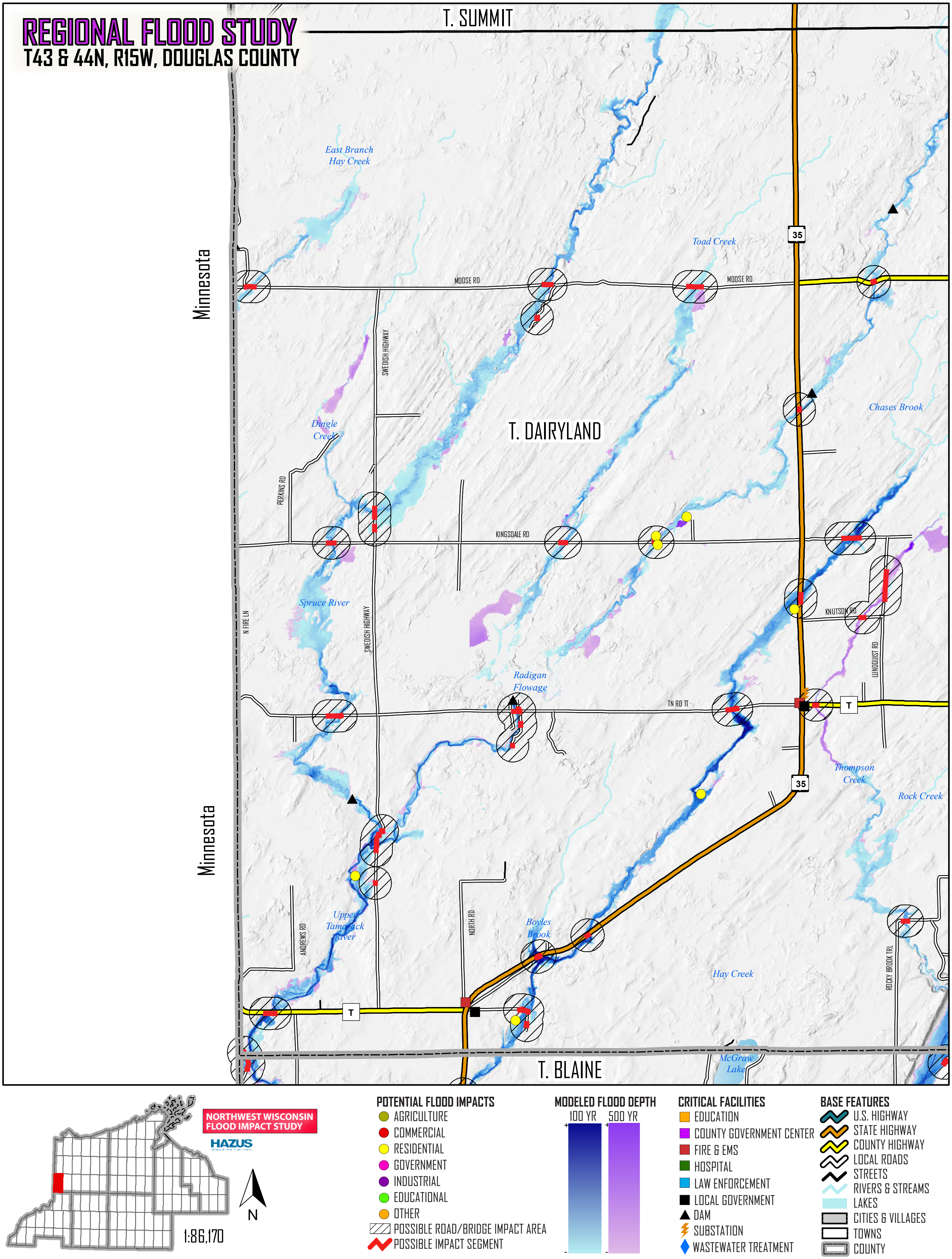
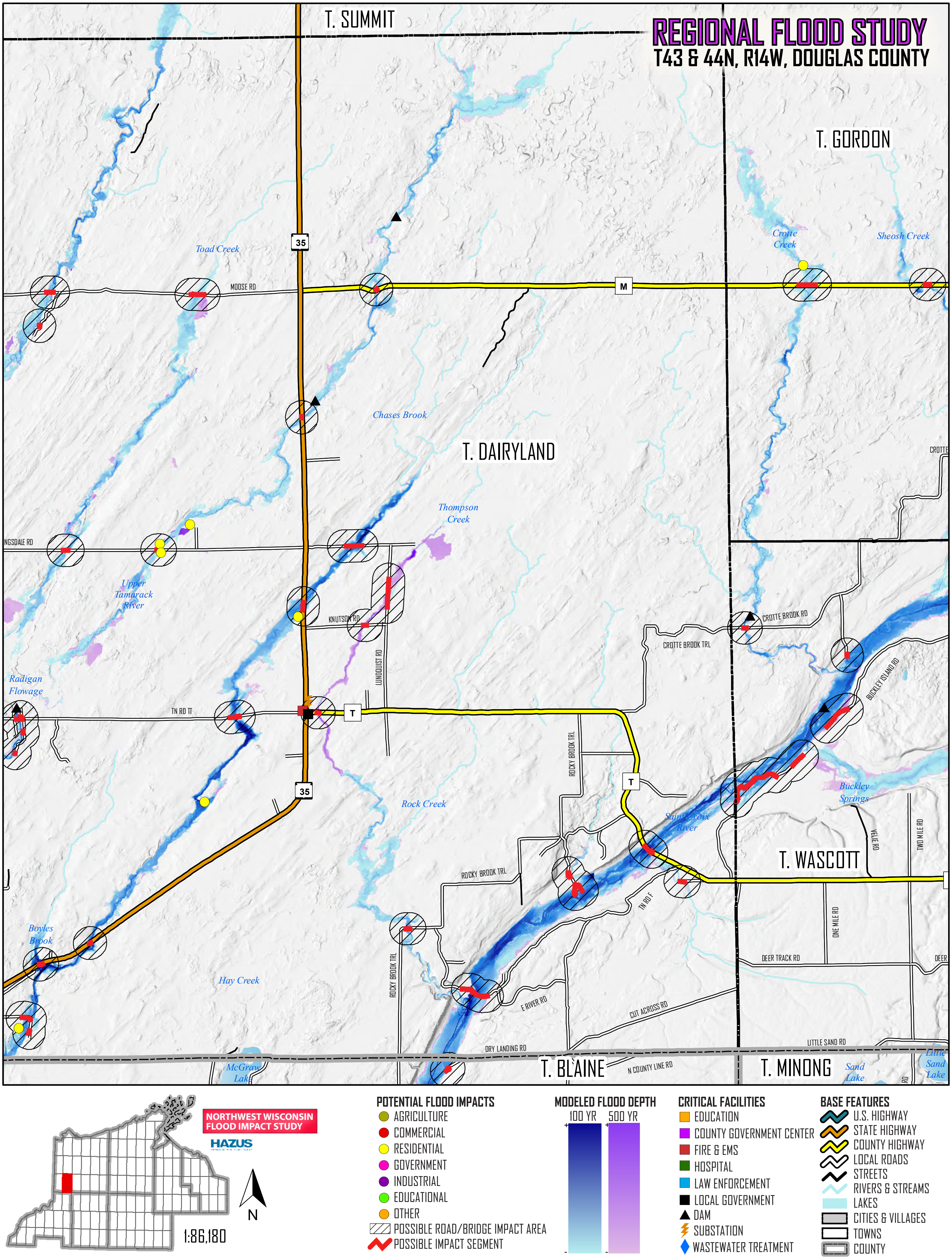
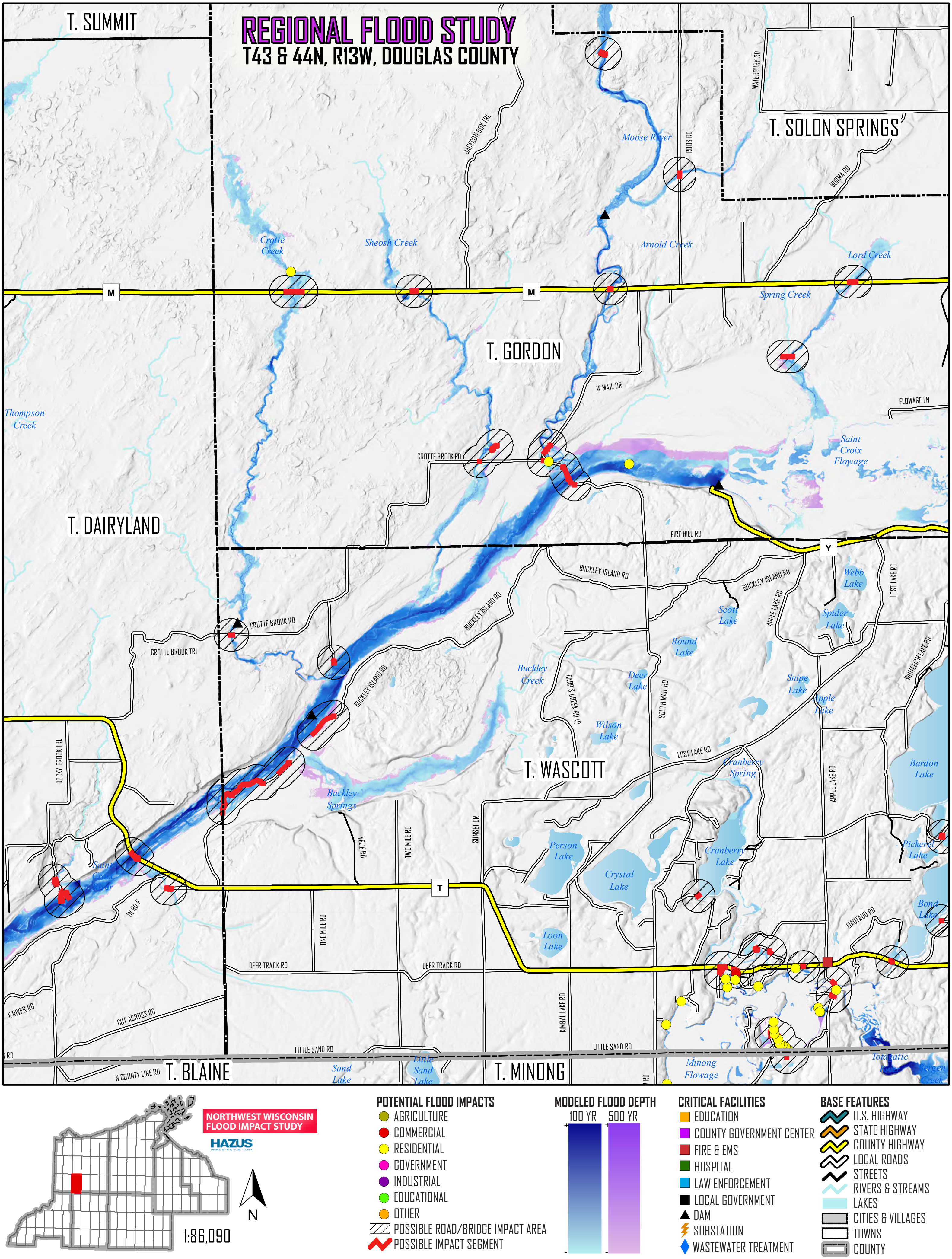


REGIONAL FLOOD STUDY
T45 & 46N, R10W, DOUGLAS COUNTY
V. LAKE NEBAGAMON
T. BRULE
T. HUGHES
T. BENNETT
T. HIGHLAND
T. BARNES
T. SOLON SPRINGS
T. GORDON
Lucius Lake
Big Lake
Rush Lake
Anderson Lake
Whisky Lake
Coffee Lake
Gander Lake
Cream Lake
Bois Brule River
McDougal Springs
Blue Springs
Bass Lake
Blue Lake
Muck Lake
Sand Lake
Loon Lake
Hopkins Lake
Sand Bar Lake
Little Island Lake
Tomahawk Lake
Priest Lake
Ellison Lake
Mirror Lake
Paradise Lake
Jack Pine Lake
Black Fox Lake
Smith Lake
Shoberg Lake
Cheney Lake
Twin Lakes
Mud Creek
Mud Creek Springs
Rock Lake
Boot Lake
Beauregard Lake
Catherine Lake
Pickerel Lake
Idlewild Lake
Flat Lake
Flamang Lake
Pine Lake
RUSH LAKE RD
HUGHES TOWN LINE RD
RADIO STATION RD
MOTTS RD
AIRPORT RD
MUCK LAKE RD
CHENEY LAKE RD
LOST LAKE RD
SUTFIN RD
TOWN LINE RD
E BEAUREGARD LAKE RD
JERSETT RD
KELLY RD
HAZEL PRAIRIE RD
SCHALLER RD (I)
VAPA RD
KHALAR RD
CEDAR ISLAND RD
FORESTRY RD
VOLKER RD
HUFFGARD RD
MORELAND LAKE RD
MOORE RD
COUNTY LINE RD
BINGO RD
MOTTS RAVINE RD
COMMISKEY RD
ROSS RD
SANDMON RD
MURRAY LAKE RD
LITTLE ISLAND RD
IDLEWILD LAKE RD
CONNORS RD
DUCK POND RD
SIMMS LAKE RD
ANDERSON RD
DAKDALE RD
27
S
A
N
Y
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,280


REGIONAL FLOOD STUDY
T43 & 44N, R15W, DOUGLAS COUNTY
T. SUMMIT
T. DAIRYLAND
T. BLAINE
Minnesota
Minnesota
East Branch Hay Creek
Toad Creek
Chases Brook
Dingle Creek
Spruce River
Radigan Flowage
Thompson Creek
Rock Creek
Upper Tamarack River
Boyles Brook
Hay Creek
McGraw Lake
MOOSE RD
KINGSDALE RD
SWEDISH HIGHWAY
PERKINS RD
N FIRE LN
KNUTSON RD
LINDQUIST RD
TN RD TT
NORTH RD
ANDREWS RD
ROCKY BROOK TRL
35
T
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,170
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T43 & 44N, R14W, DOUGLAS COUNTY
T. SUMMIT
T. GORDON
T. DAIRYLAND
T. WASCOTT
T. BLAINE
T. MINONG
Toad Creek
Chases Brook
Crotte Creek
Sheosh Creek
Thompson Creek
Upper Tamarack River
Radigan Flowage
Rock Creek
Saint Croix River
Buckley Springs
Boyles Brook
Hay Creek
McGraw Lake
Sand Lake
Little Sand Lake
MOOSE RD
KNUTSON RD
LUNDQUIST RD
TN RD TT
CROTTE BROOK RD
CROTTE BROOK TRL
BUCKLEY ISLAND RD
ROCKY BROOK TRL
TN RD F
VELIE RD
TWO MILE RD
ONE MILE RD
DEER TRACK RD
E RIVER RD
CUT ACROSS RD
DRY LANDING RD
LITTLE SAND RD
N COUNTY LINE RD
35
M
T
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,180


REGIONAL FLOOD STUDY
T43 & 44N, R13W, DOUGLAS COUNTY
T. SUMMIT
T. SOLON SPRINGS
T. GORDON
T. DAIRYLAND
T. WASCOTT
T. BLAINE
T. MINONG
Moose River
Crotte Creek
Sheosh Creek
Arnold Creek
Lord Creek
Spring Creek
Thompson Creek
Saint Croix Flowage
Buckley Creek
Buckley Springs
Webb Lake
Scott Lake
Spider Lake
Round Lake
Deer Lake
Snipe Lake
Apple Lake
Wilson Lake
Cranberry Spring
Bardon Lake
Person Lake
Crystal Lake
Cranberry Lake
Pickerel Lake
Bond Lake
Loon Lake
Sand Lake
Little Sand Lake
Minong Flowage
JACKSON BOX TRL
WATERBURY RD
ROOS RD
BURMA RD
W MAIL DR
FLOWAGE LN
CROTTE BROOK RD
FIRE HILL RD
BUCKLEY ISLAND RD
APPLE LAKE RD
LOST LAKE RD
WHITEFISH LAKE RD
CROTTE BROOK TRL
CARP'S CREEK RD
SOUTH MAIL RD
ROCKY BROOK TRL
WELIE RD
TWO MILE RD
SUNSET DR
ONE MILE RD
DEER TRACK RD
LIAUTAUD RD
TN RD F
E RIVER RD
CUT ACROSS RD
KIMBAL LAKE RD
LITTLE SAND RD
N COUNTY LINE RD
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
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INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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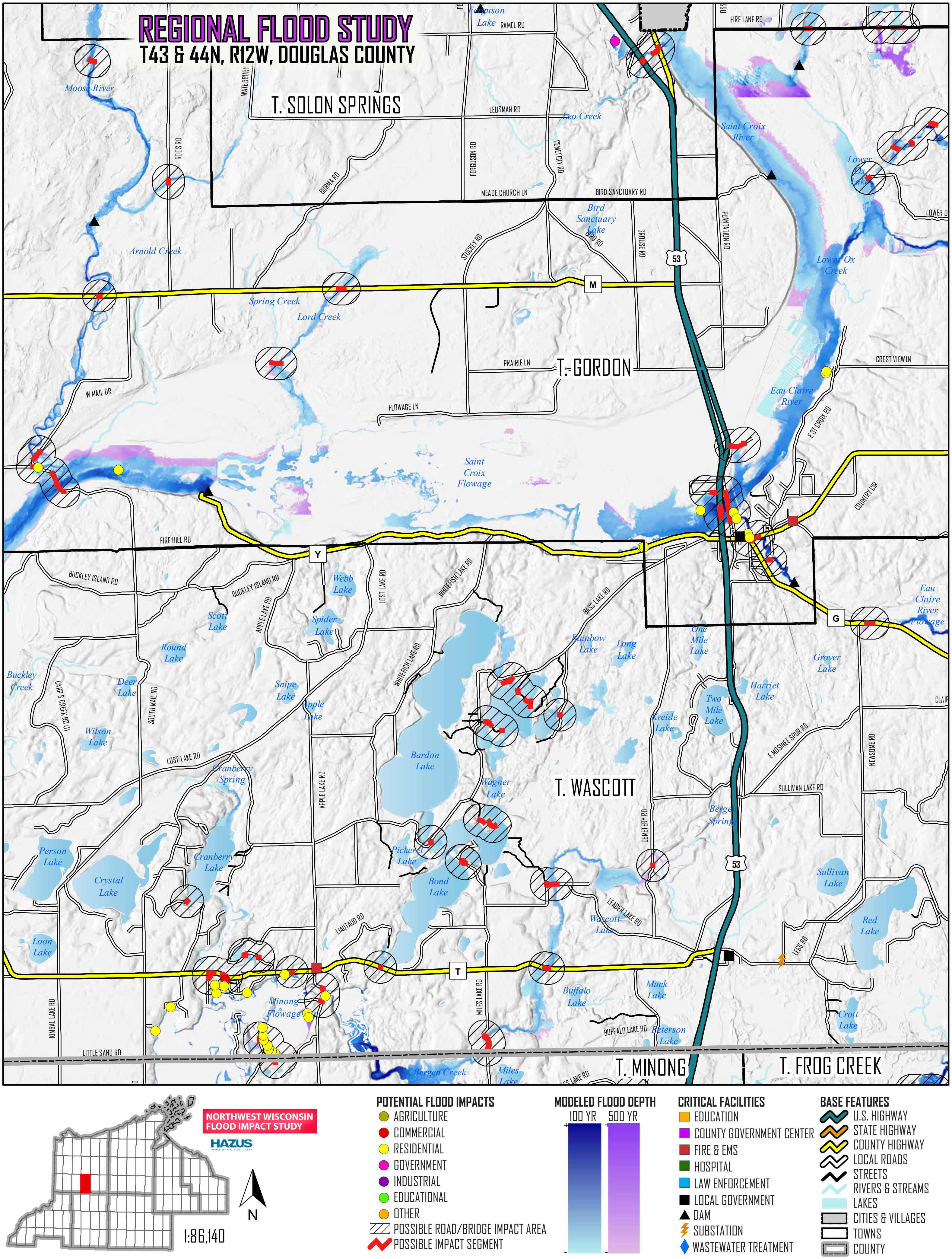

REGIONAL FLOOD STUDY
T43 & 44N, R12W, DOUGLAS COUNTY
T. SOLON SPRINGS
T. GORDON
T. WASCOTT
T. MINONG
T. FROG CREEK
Moose River
Arnold Creek
Spring Creek
Lord Creek
Leo Creek
Saint Croix River
Lower Ox Lake
Lower Ox Creek
Bird Sanctuary Lake
Saint Croix Flowage
Eau Claire River
Eau Claire River Flowage
Webb Lake
Spider Lake
Scott Lake
Round Lake
Buckley Creek
Deer Lake
Snipe Lake
Apple Lake
Wilson Lake
Bardon Lake
Wagner Lake
Rainbow Lake
Long Lake
One Mile Lake
Two Mile Lake
Kreide Lake
Harriet Lake
Grover Lake
Cranberry Spring
Cranberry Lake
Person Lake
Crystal Lake
Loon Lake
Pickerel Lake
Bond Lake
Minong Flowage
Wascott Lake
Buffalo Lake
Muck Lake
Peterson Lake
Berge Spring
Sullivan Lake
Red Lake
Croft Lake
Bergen Creek
Miles Lake
RAMEL RD
LEUSMAN RD
FIRE LANE RD
WATERBURY
RODS RD
BURMA RD
FERGUSON RD
CEMETERY RD
MEADE CHURCH LN
BIRD SANCTUARY RD
BIRD RD
GROUSE RD
PLANTATION RD
STUCKEY RD
LOWER OX
53
M
PRAIRIE LN
FLOWAGE LN
W MAIL DR
CREST VIEW LN
E ST CROIX RD
COUNTRY DR
FIRE HILL RD
Y
G
BUCKLEY ISLAND RD
APPLE LAKE RD
LOST LAKE RD
WHITEFISH LAKE RD
BASS LAKE RD
CARPS CREEK RD
SOUTH MAIL RD
E MOSINEE SPUR RD
NEWSOME RD
SULLIVAN LAKE RD
LEADER LAKE RD
LIAUTAUD RD
MILES LAKE RD
KIMBAL LAKE RD
LITTLE SAND RD
BUFFALO LAKE RD
LEGG RD
T
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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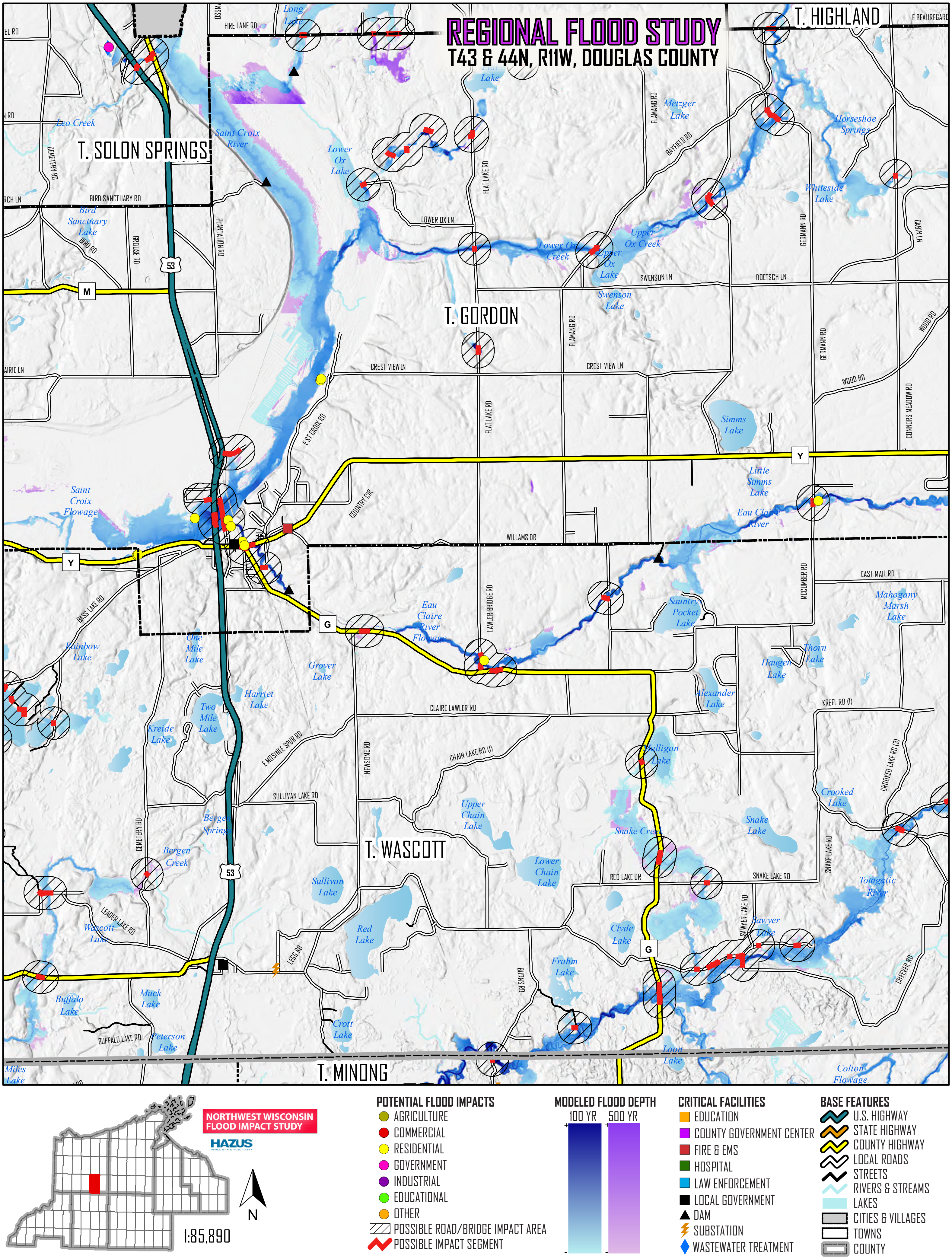
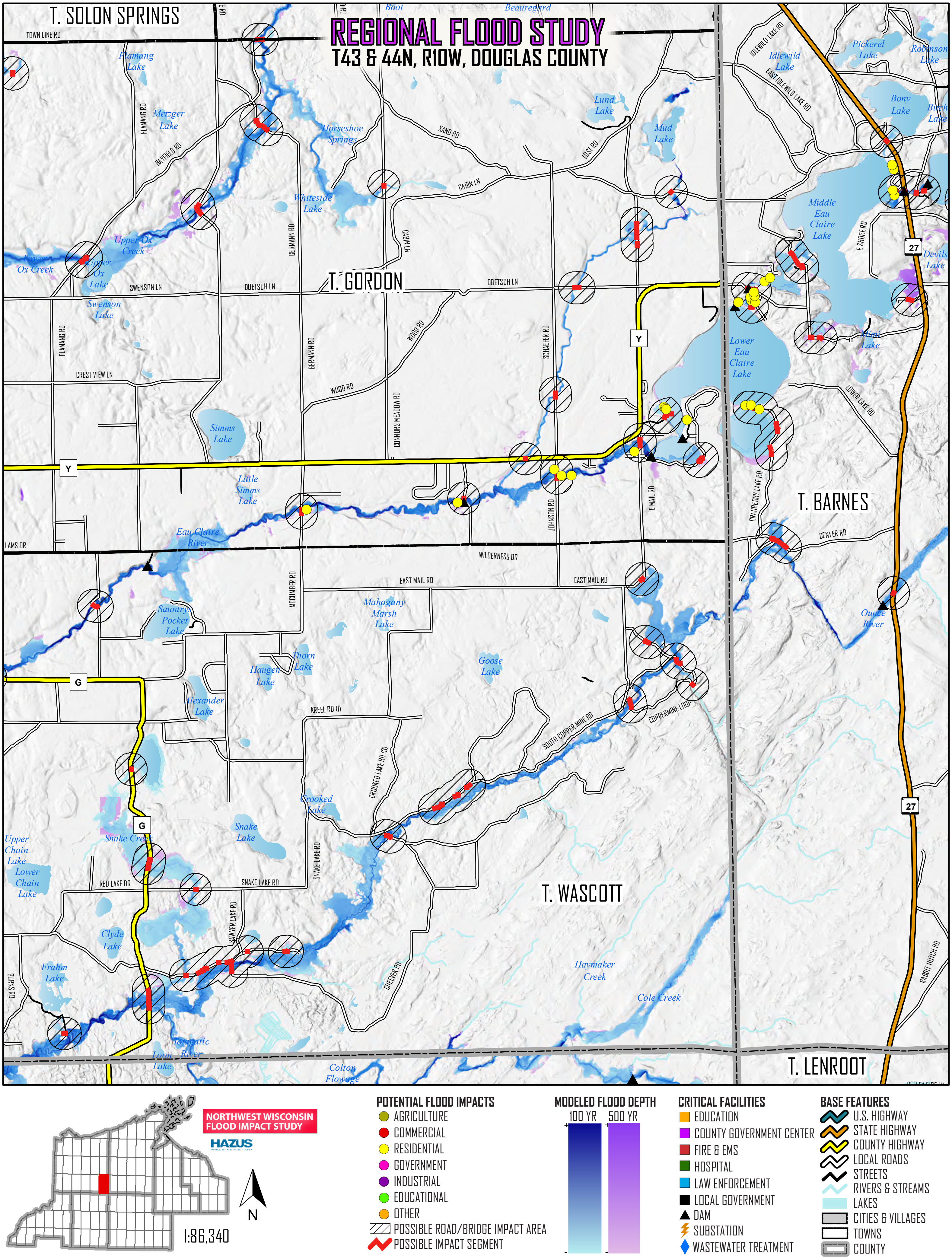
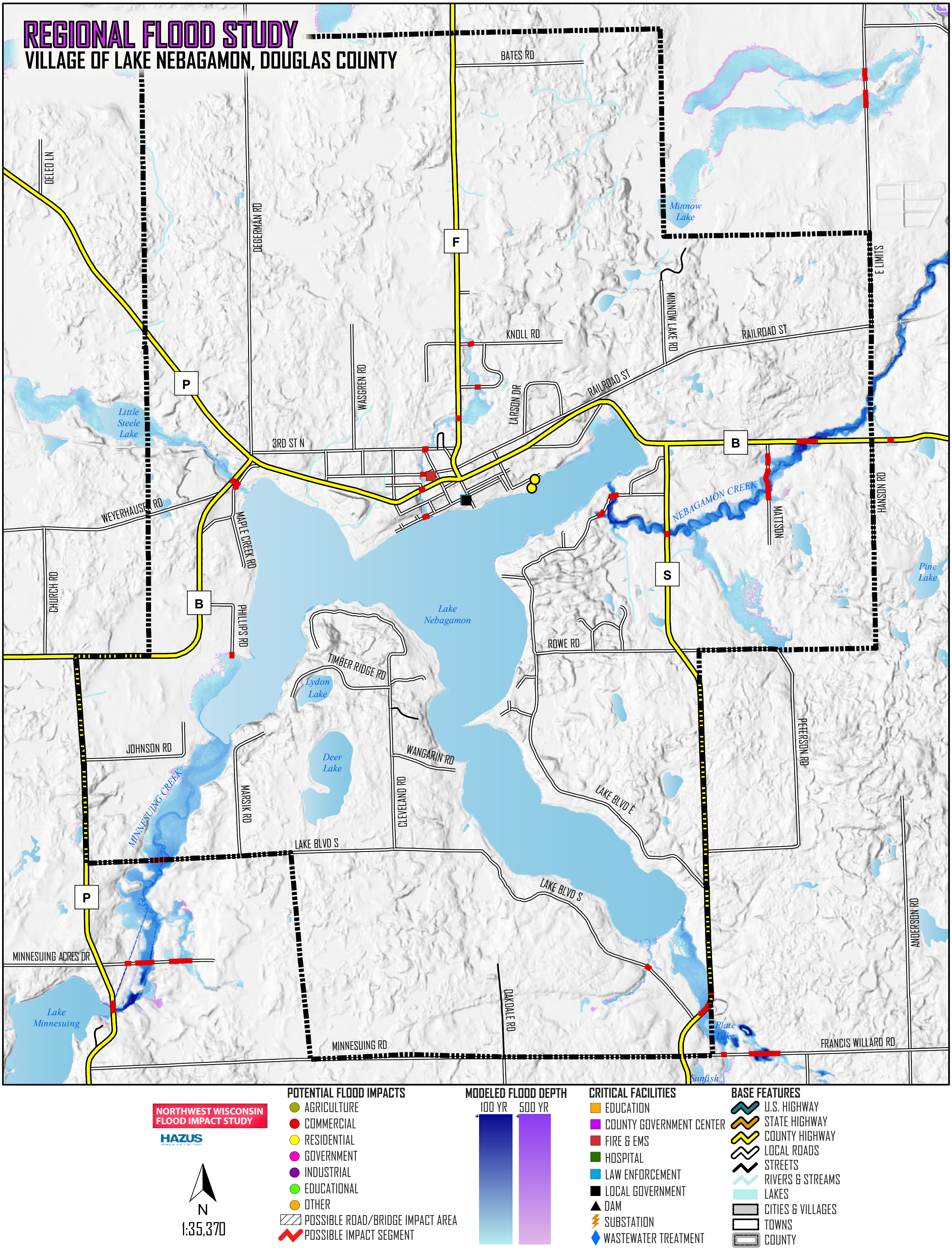
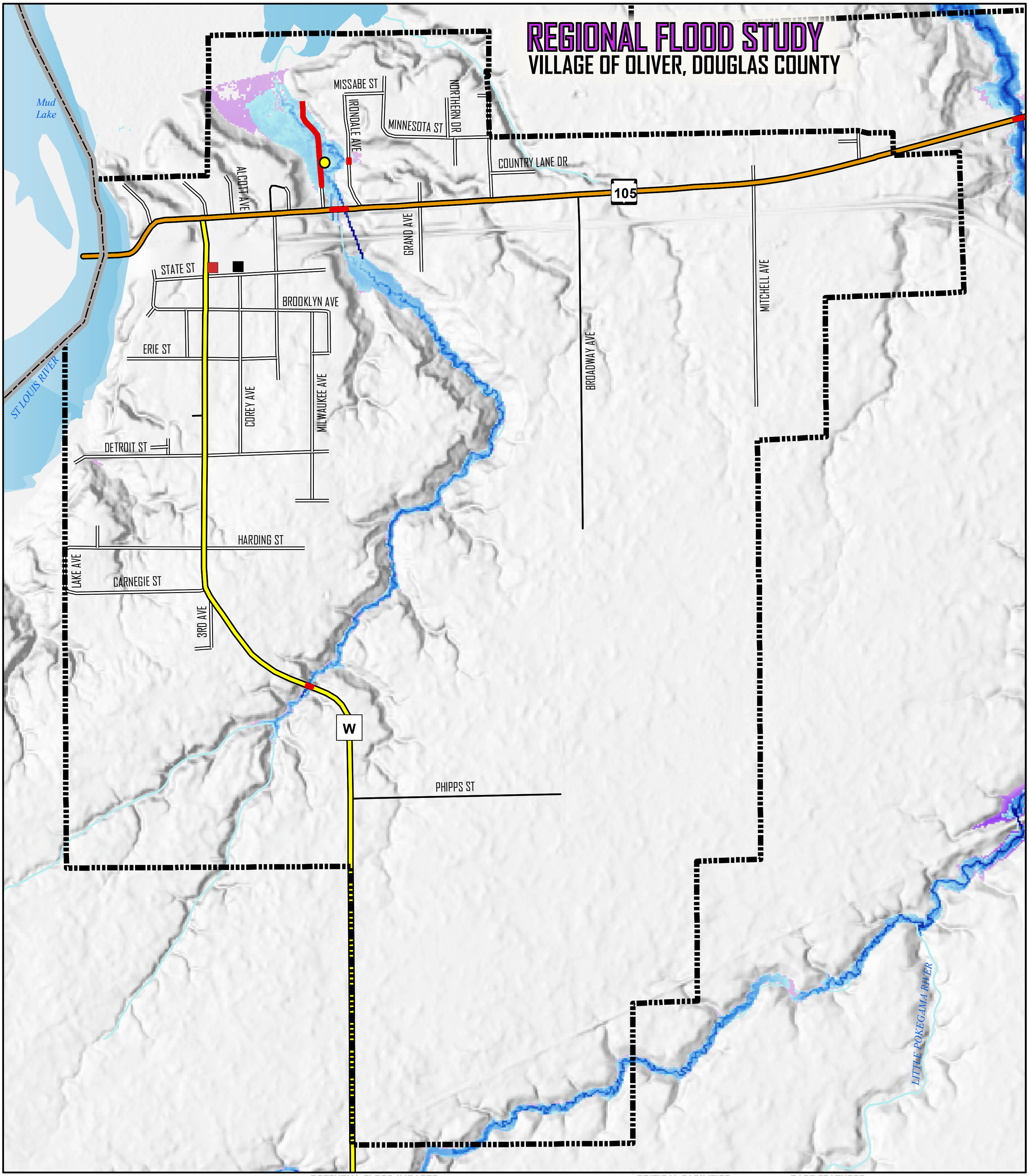

REGIONAL FLOOD STUDY
T43 & 44N, R11W, DOUGLAS COUNTY
T. HIGHLAND
T. SOLON SPRINGS
T. GORDON
T. WASCOTT
T. MINONG
Leo Creek
Saint Croix River
Lower Ox Lake
Long Lake
Flat Lake
Metzger Lake
Horseshoe Springs
Whiteside Lake
Bird Sanctuary Lake
Lower Ox Creek
Upper Ox Creek
Upper Ox Lake
Swenson Lake
Simms Lake
Little Simms Lake
Eau Claire River
Saint Croix Flowage
Eau Claire River Flowage
Sauntrys Pocket Lake
Mahogany Marsh Lake
Thorn Lake
Haugen Lake
Alexander Lake
Rainbow Lake
One Mile Lake
Grover Lake
Harriet Lake
Two Mile Lake
Kreide Lake
Mulligan Lake
Crooked Lake
Upper Chain Lake
Snake Creek
Snake Lake
Bergen Spring
Bergen Creek
Lower Chain Lake
Sullivan Lake
Tolagatic River
Wascott Lake
Red Lake
Clyde Lake
Sawyer Lake
Frahm Lake
Buffalo Lake
Muck Lake
Peterson Lake
Crott Lake
Loon Lake
Colton Flowage
Miles Lake
FIRE LANE RD
BIRD SANCTUARY RD
BIRD RD
GROUSE RD
PLANTATION RD
CEMETERY RD
LOWER OX LN
FLAT LAKE RD
FLAMANG RD
BAYFIELD RD
GERMANN RD
CABIN LN
SWENSON LN
DOETSCH LN
CREST VIEW LN
WOOD RD
CONNORS MEADOW RD
E ST CROIX RD
COUNTRY CIR
WILLAMS DR
EAST MAIL RD
MCCUMBER RD
LAWLER BRIDGE RD
BASS LAKE RD
CLAIRE LAWLER RD
KREEL RD (I)
E MOSINEE SPUR RD
CHAIN LAKE RD (I)
CROOKED LAKE RD (3)
NEWSOME RD
SULLIVAN LAKE RD
CEMETERY RD
RED LAKE DR
SNAKE LAKE RD
SNAKE LAKE RD
SAWYER LAKE RD
LEADER LAKE RD
LEGG RD
BURNS RD
BUFFALO LAKE RD
CHEEVER RD
E BEAUREGARD
53
M
Y
G
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:85,890


REGIONAL FLOOD STUDY
T43 & 44N, R10W, DOUGLAS COUNTY
T. SOLON SPRINGS
T. GORDON
T. BARNES
T. WASCOTT
T. LENROOT
TOWN LINE RD
Flamang Lake
Metzger Lake
Horseshoe Springs
Whiteside Lake
Upper Ox Creek
Lower Ox Creek
Upper Ox Lake
Swenson Lake
Lund Lake
Mud Lake
Idlewild Lake
Pickerel Lake
Robinson Lake
Bony Lake
Birch Lake
Middle Eau Claire Lake
Devils Lake
Lower Eau Claire Lake
Mimi Lake
Simms Lake
Little Simms Lake
Eau Claire River
Sauntry Pocket Lake
Mahogany Marsh Lake
Thorn Lake
Haugen Lake
Goose Lake
Alexander Lake
Crooked Lake
Snake Lake
Snake Creek
Upper Chain Lake
Lower Chain Lake
Clyde Lake
Frahm Lake
Loon Lake
Totagatic River
Colton Flowage
Haymaker Creek
Cole Creek
Ounce River
FLAMANG RD
BAYFIELD RD
SAND RD
CABIN LN
LOST RD
GERMANN RD
SWENSON LN
DOETSCH LN
WOOD RD
SCHAEFER RD
CREST VIEW LN
CONNORS MEADOW RD
JOHNSON RD
E MAIL RD
CRANBERRY LAKE RD
DENVER RD
LOWER LAKE RD
E SHORE RD
IDLEWILD LAKE RD
EAST IDLEWILD LAKE RD
WILDERNESS DR
EAST MAIL RD
MCCUMBER RD
KREEL RD (I)
CROOKED LAKE RD (3)
SOUTH COPPER MINE RD
COPPERMINE LOOP
SNAKE LAKE RD
SNAKE LAKE RD
RED LAKE DR
SAWYER LAKE RD
CHEEVER RD
BURNS RD
RABBIT HUTCH RD
Y
G
27
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,340
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
VILLAGE OF LAKE NEBAGAMON, DOUGLAS COUNTY
BATES RD
DELEO LN
DEGERMAN RD
F
Minnow Lake
MINNOW LAKE RD
E LIMITS
KNOLL RD
RAILROAD ST
RAILROAD ST
WASGREN RD
LARSON DR
P
Little Steele Lake
3RD ST N
B
WEYERHAUSER RD
MAPLE CREEK RD
NEBAGAMON CREEK
MATTSON
HANSON RD
S
Pine Lake
CHURCH RD
B
PHILLIPS RD
Lake Nebagamon
ROWE RD
TIMBER RIDGE RD
Lydon Lake
JOHNSON RD
Deer Lake
WANGARIN RD
PETERSON RD
MINNESUING CREEK
MARSIK RD
CLEVELAND RD
LAKE BLVD E
LAKE BLVD S
LAKE BLVD S
P
ANDERSON RD
MINNESUING ACRES DR
DAKOTA RD
Lake Minnesuing
Plate Lake
MINNESUING RD
FRANCIS WILLARD RD
Sunfish
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:35,370
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

REGIONAL FLOOD STUDY
VILLAGE OF OLIVER, DOUGLAS COUNTY



NORTHWEST WISCONSIN FLOOD IMPACT STUDY

HAZUS

N

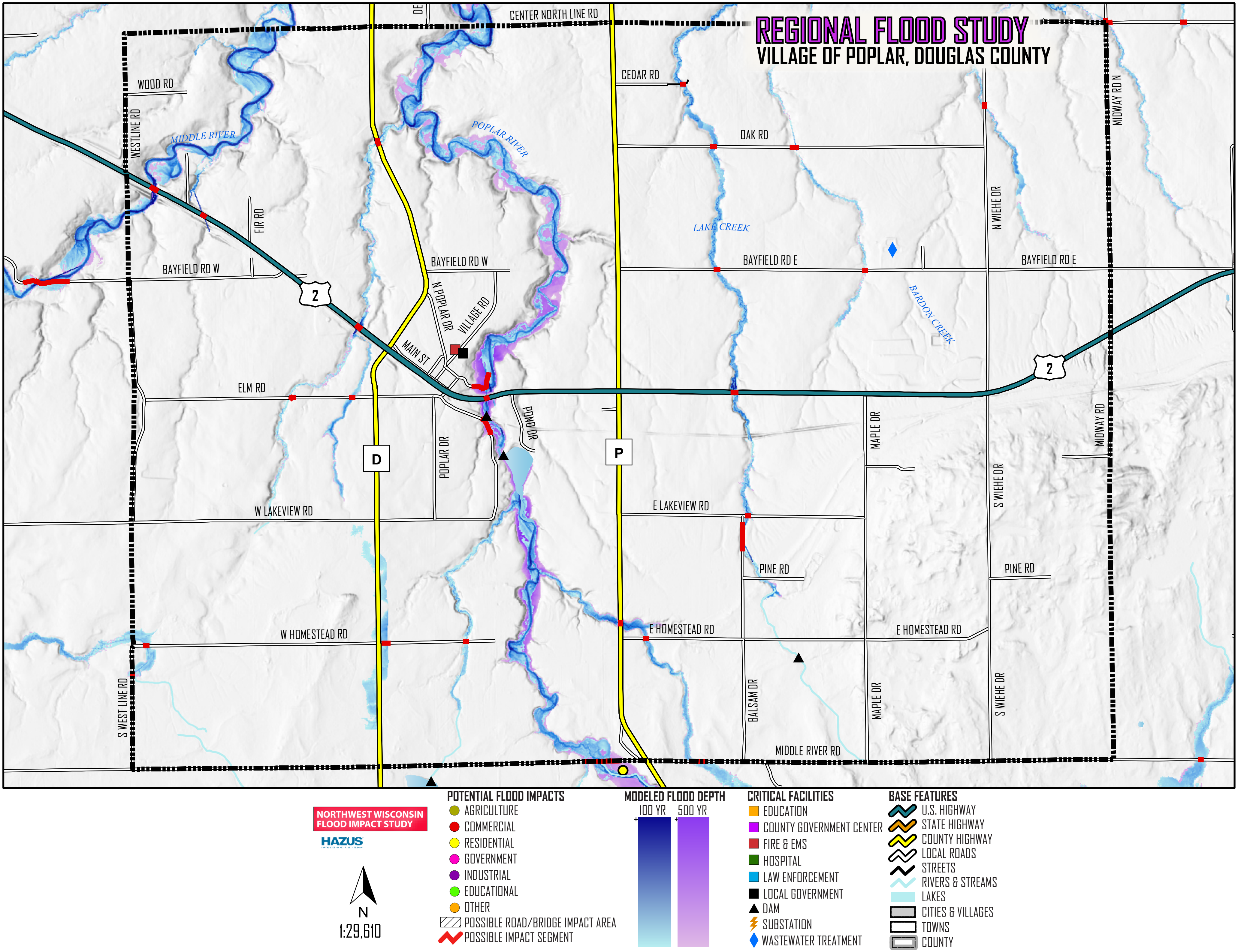
1:14,220

POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

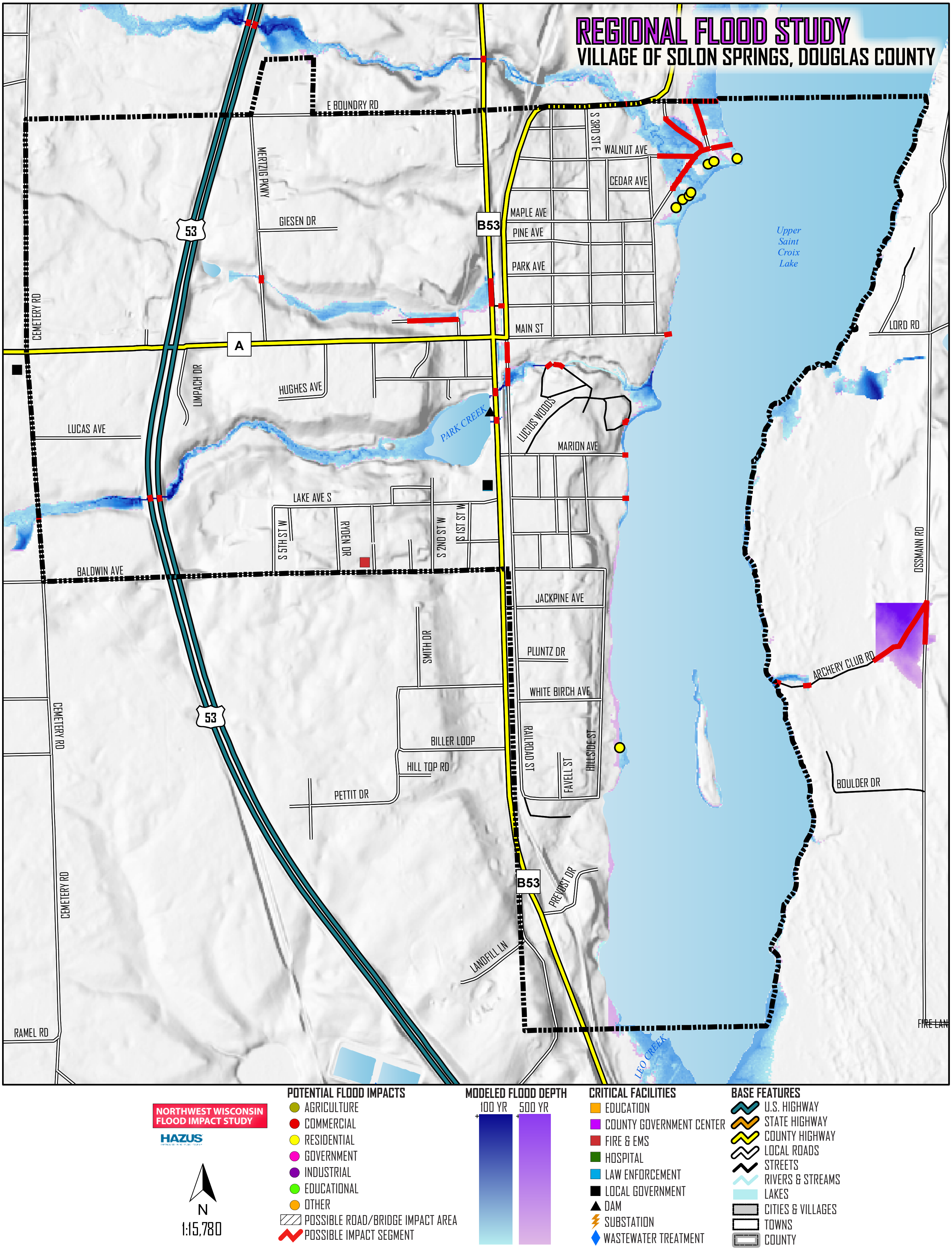
MODELED FLOOD DEPTH
100 YR | 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



REGIONAL FLOOD STUDY
VILLAGE OF POPLAR, DOUGLAS COUNTY
CENTER NORTH LINE RD
WOOD RD
WESTLINE RD
MIDDLE RIVER
POPLAR RIVER
CEDAR RD
OAK RD
MIDWAY RD N
N WIEHE DR
LAKE CREEK
FIR RD
BAYFIELD RD W
BAYFIELD RD E
BARDON CREEK
N POPLAR DR
VILLAGE RD
MAIN ST
ELM RD
POND DR
POPLAR DR
MAPLE DR
MIDWAY RD
S WIEHE DR
W LAKEVIEW RD
E LAKEVIEW RD
PINE RD
W HOMESTEAD RD
E HOMESTEAD RD
S WEST LINE RD
BALSAM DR
MIDDLE RIVER RD
2
D
P
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:29,610
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF SOLON SPRINGS, DOUGLAS COUNTY
Upper Saint Croix Lake
PARK CREEK
LEO CREEK
E BOUNDRY RD
MERTZIG PKWY
GIESEN DR
CEMETERY RD
LIMPACH DR
HUGHES AVE
LUCAS AVE
LAKE AVE S
S 5TH ST W
RYDEN DR
S 2ND ST W
S 1ST ST W
BALDWIN AVE
SMITH DR
BILLER LOOP
HILL TOP RD
PETTIT DR
LANDFILL LN
RAMEL RD
S 3RD ST E
WALNUT AVE
CEDAR AVE
MAPLE AVE
PINE AVE
PARK AVE
MAIN ST
LUCIUS WOODS
MARION AVE
JACKPINE AVE
PLUNTZ DR
WHITE BIRCH AVE
RAILROAD ST
FAVELL ST
HILLSIDE ST
PREVOST DR
LORD RD
OSSMANN RD
ARCHERY CLUB RD
BOULDER DR
FIRE LAN
53
B53
A
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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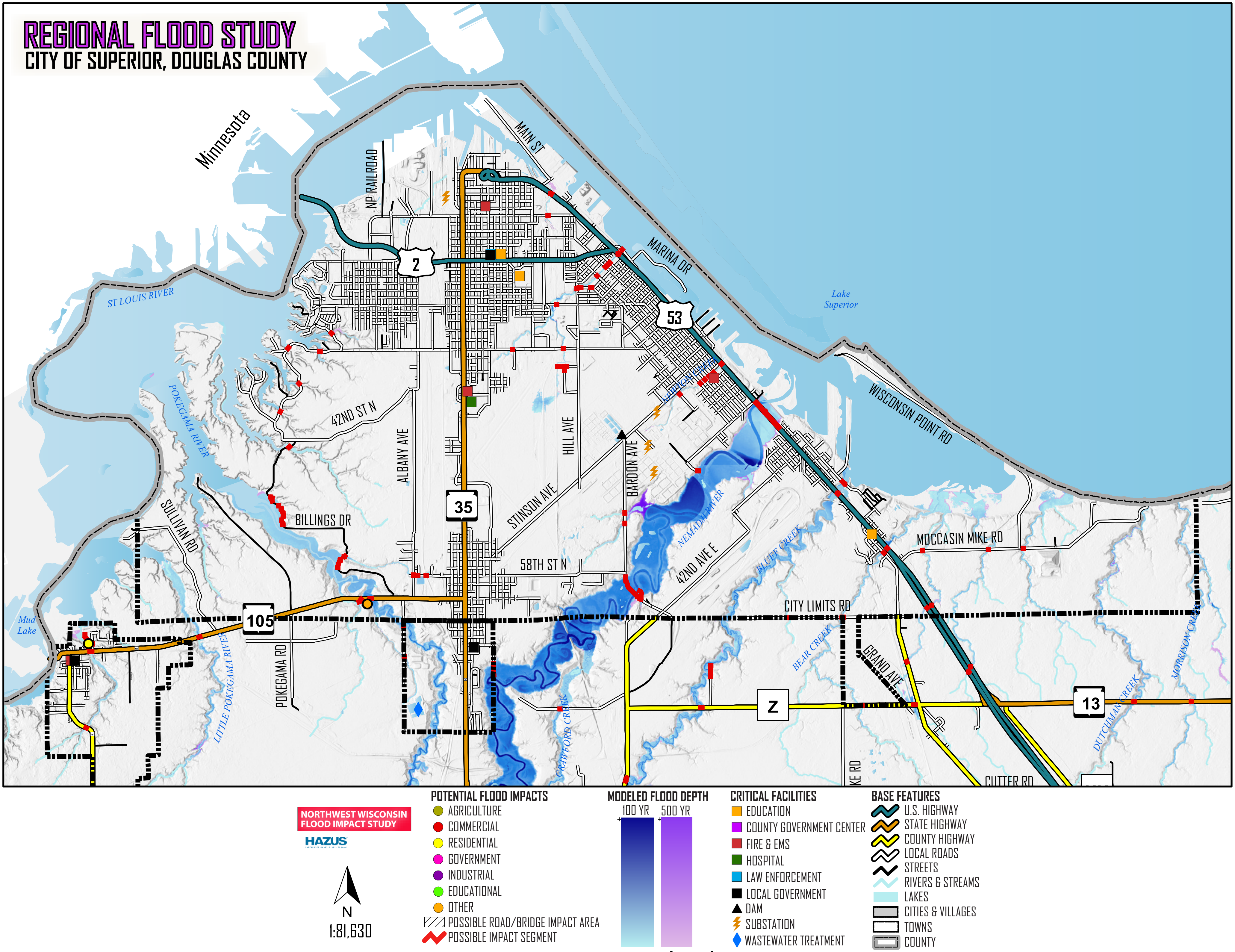
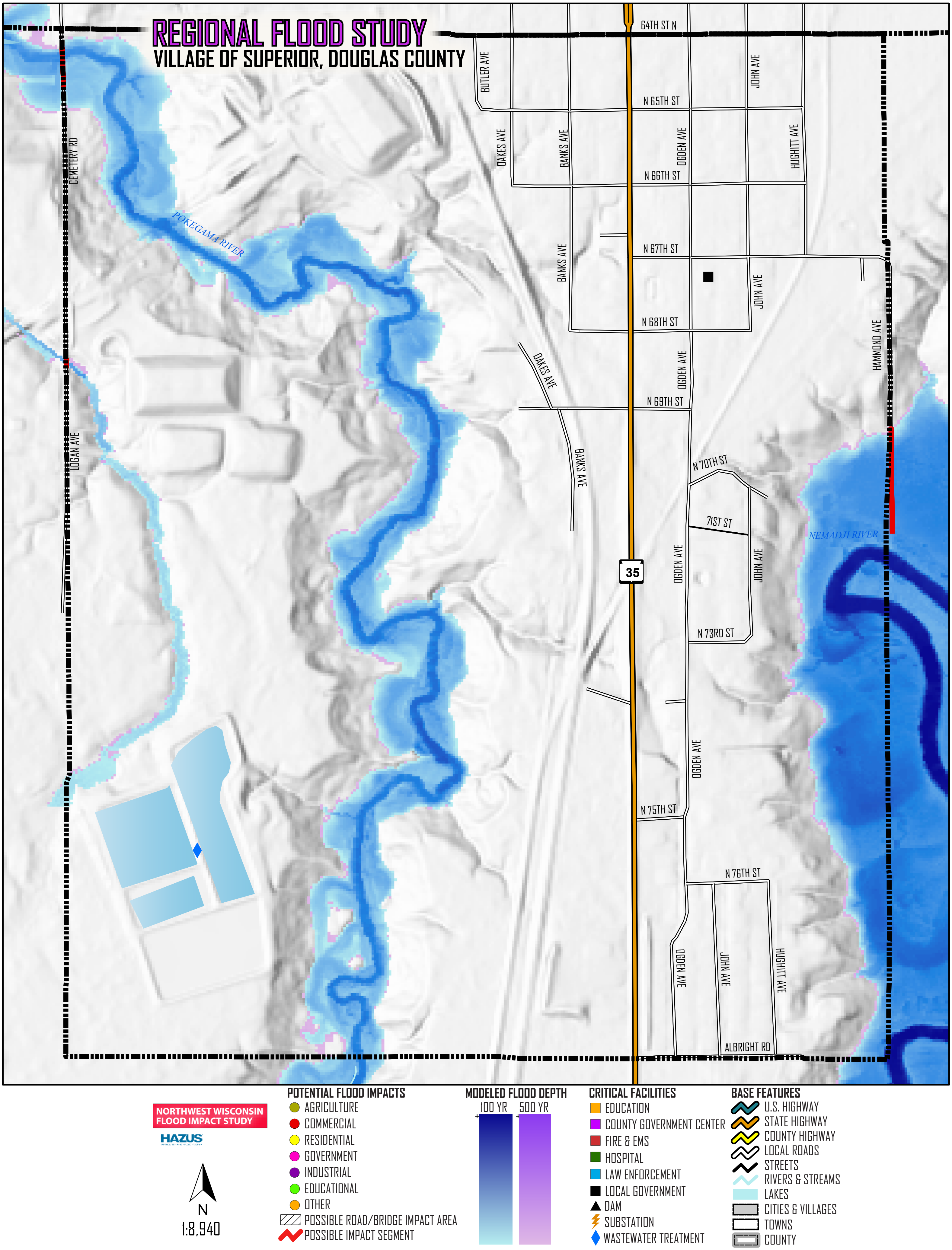
1:15,780
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
CITY OF SUPERIOR, DOUGLAS COUNTY
Minnesota
Lake Superior
ST LOUIS RIVER
POKEGAMA RIVER
LITTLE POKEGAMA RIVER
NEMADJI RIVER
BLUFF CREEK
BEAR CREEK
CRAWFORD CREEK
DUTCHMAN CREEK
MORRISON CREEK
Mud Lake
NP RAILROAD
MAIN ST
MARINA DR
WISCONSIN POINT RD
42ND ST N
ALBANY AVE
HILL AVE
STINSON AVE
BARDON AVE
42ND AVE E
BILLINGS DR
SULLIVAN RD
POKEGAMA RD
58TH ST N
MOCCASIN MIKE RD
CITY LIMITS RD
GRAND AVE
CUTTER RD
2
53
35
105
13
Z
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:81,630
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
VILLAGE OF SUPERIOR, DOUGLAS COUNTY
64TH ST N
BUTLER AVE
JOHN AVE
N 65TH ST
OAKES AVE
BANKS AVE
OGDEN AVE
HUGHITT AVE
N 66TH ST
CEMETERY RD
POKEGAMA RIVER
N 67TH ST
BANKS AVE
JOHN AVE
N 68TH ST
HAMMOND AVE
OAKES AVE
OGDEN AVE
N 69TH ST
LOGAN AVE
BANKS AVE
N 70TH ST
71ST ST
NEMADJI RIVER
35
OGDEN AVE
JOHN AVE
N 73RD ST
OGDEN AVE
N 75TH ST
N 76TH ST
OGDEN AVE
JOHN AVE
HUGHITT AVE
ALBRIGHT RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:8,940
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

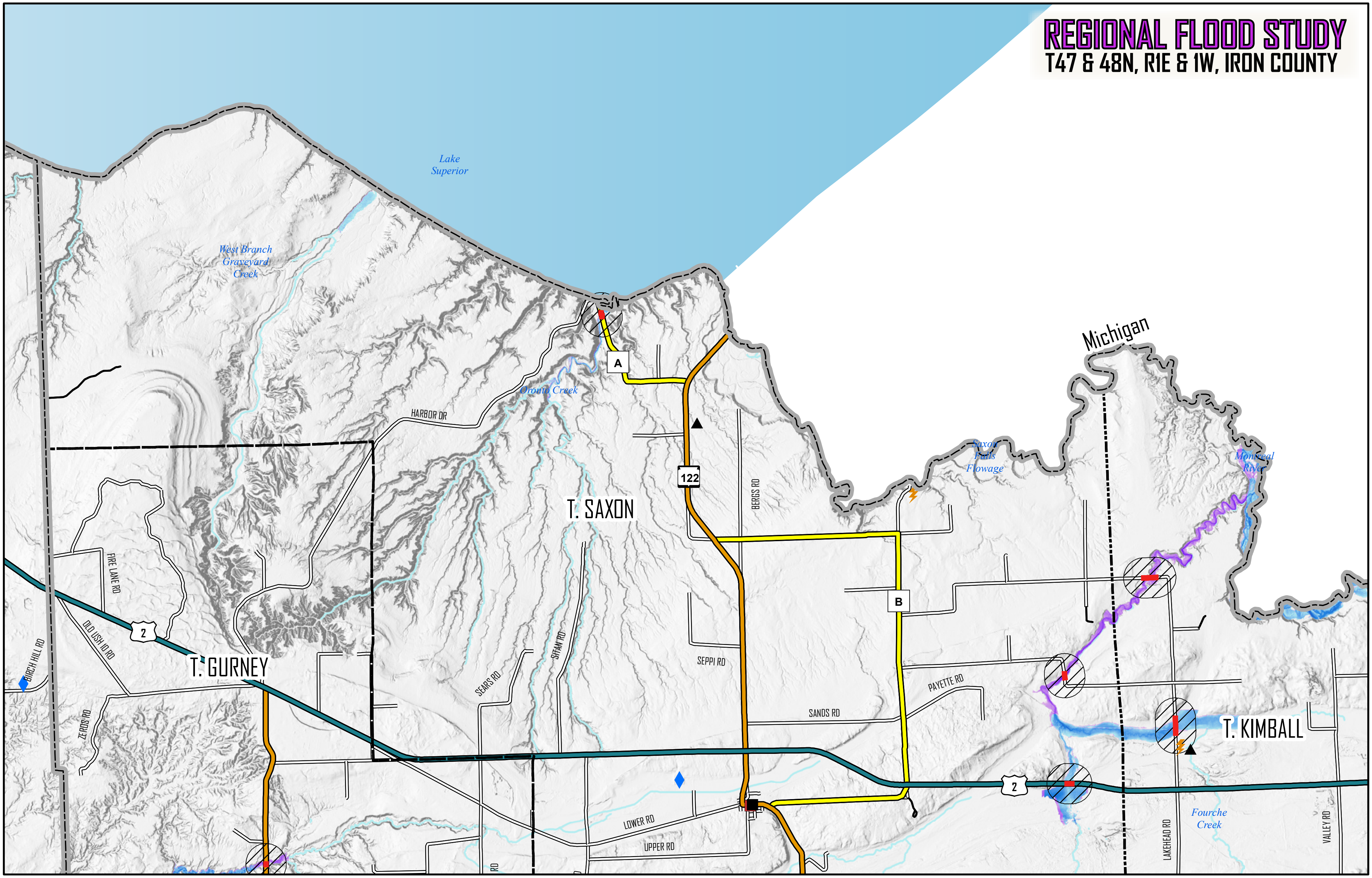
IRON COUNTY

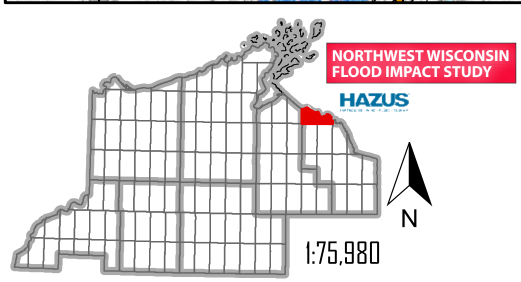
HAZUS 100-YEAR FLOOD LOSS ESTIMATES - IRON COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF HURLEY	15	$ 161,962.00	$ 313,406.00	$ 55,712.00	221
C. OF MONTREAL	1	$ 1,440.00	$ 353.00	$ -	12
T. OF ANDERSON	1	$ 6,840.00	$ 52.00	$ -	15
T. OF CAREY	1	$ 2,806.00	$ 1,407.00	$ -	11
T. OF GURNEY	1	$ 5,669.00	$ 1,662.00	$ -	14
T. OF KIMBALL	4	$ 91,227.00	$ 121,798.00	$ 57,969.00	286
T. OF MERCER	12	$ 123,583.00	$ 138,339.00	$ -	67
T. OF OMA	10	$ 5,856.00	$ 2,634.00	$ -	56
GRAND TOTAL	**45**	**$ 399,383.00**	**$ 579,651.00**	**$ 113,681.00**	**682**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - IRON COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF HURLEY	5	$ 33,748.00	$ 28,777.00	$ 9,924.00	62
C. OF MONTREAL	1	$ 5,660.00	$ 1,936.00	$ -	12
T. OF CAREY	1	$ -	$ -	$ -	7
T. OF GURNEY	4	$ 9,031.00	$ 3,900.00	$ -	70
T. OF KIMBALL	3	$ 14,200.00	$ 8,079.00	$ -	86
T. OF MERCER	20	$ 159,628.00	$ 144,041.00	$ -	131
T. OF OMA	14	$ 27,397.00	$ 10,231.00	$ -	75
GRAND TOTAL	**48**	**$ 249,664.00**	**$ 196,964.00**	**$ 9,924.00**	**443**





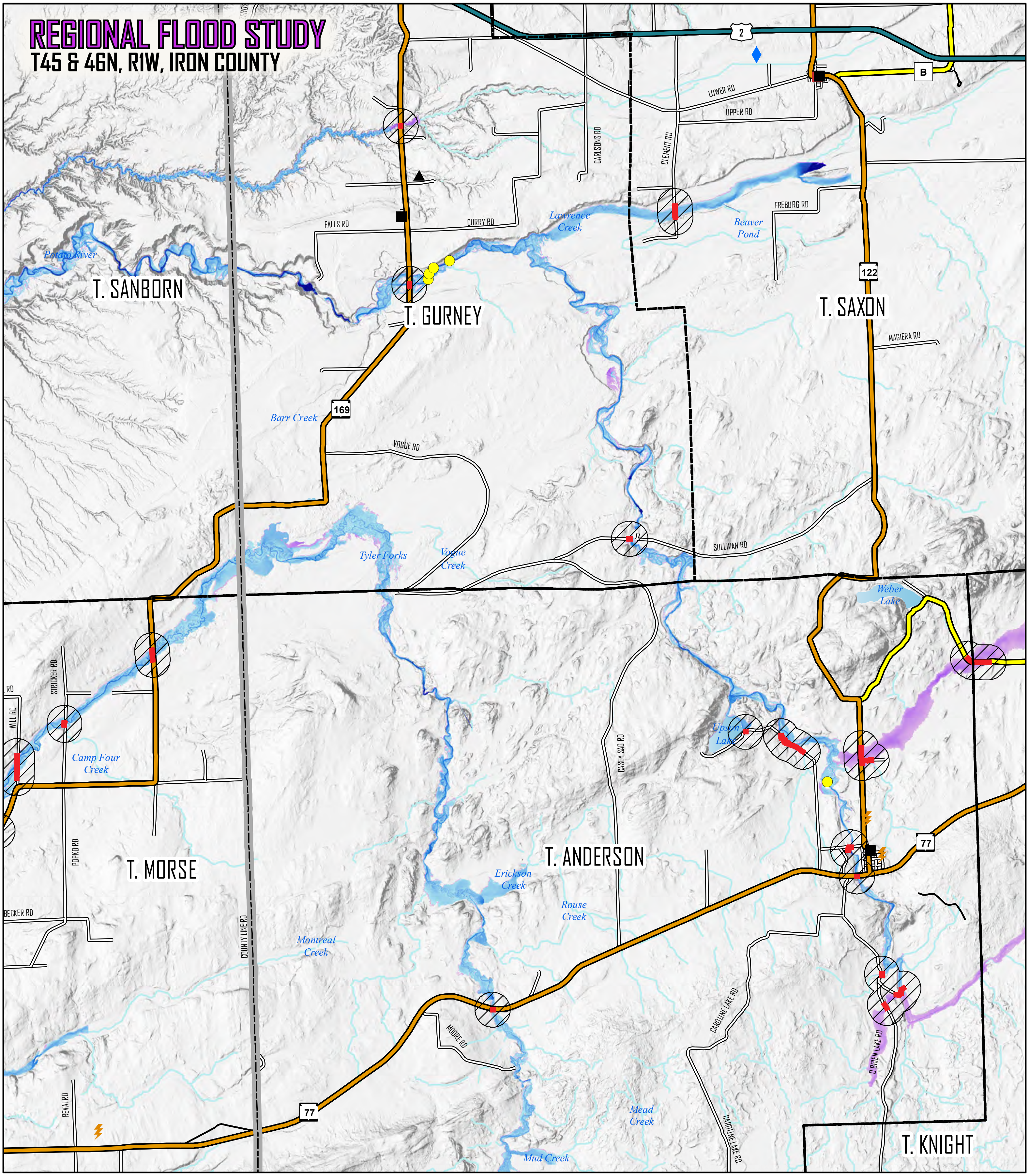
POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH
100 YR | 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY

REGIONAL FLOOD STUDY
T45 & 46N, R1W, IRON COUNTY

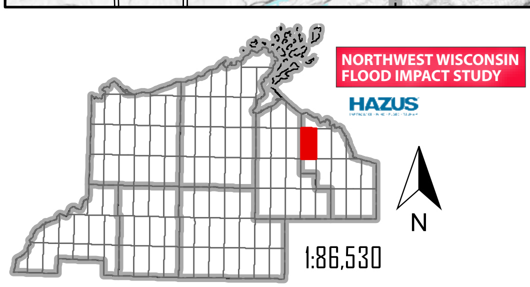


POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH
100 YR | 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



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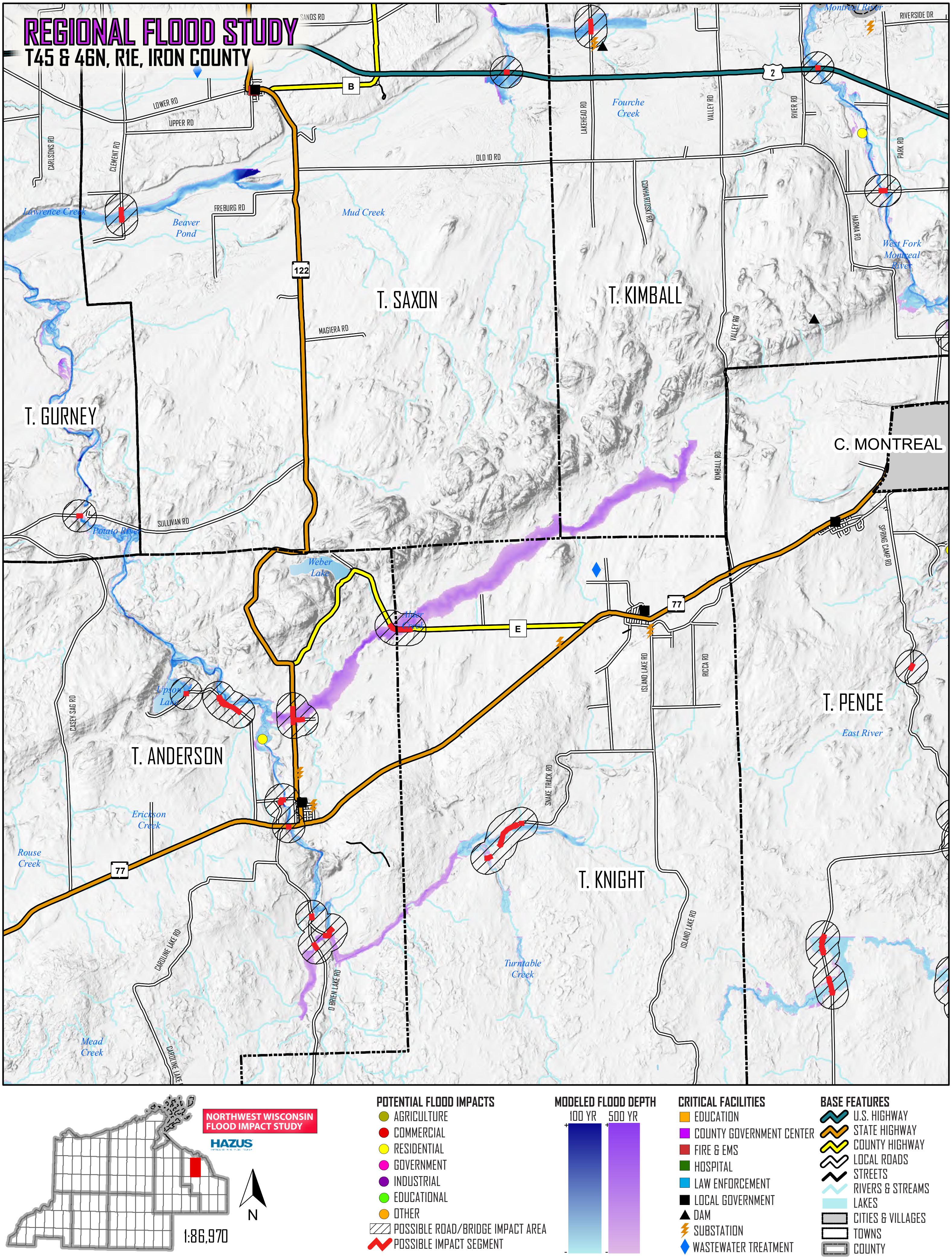
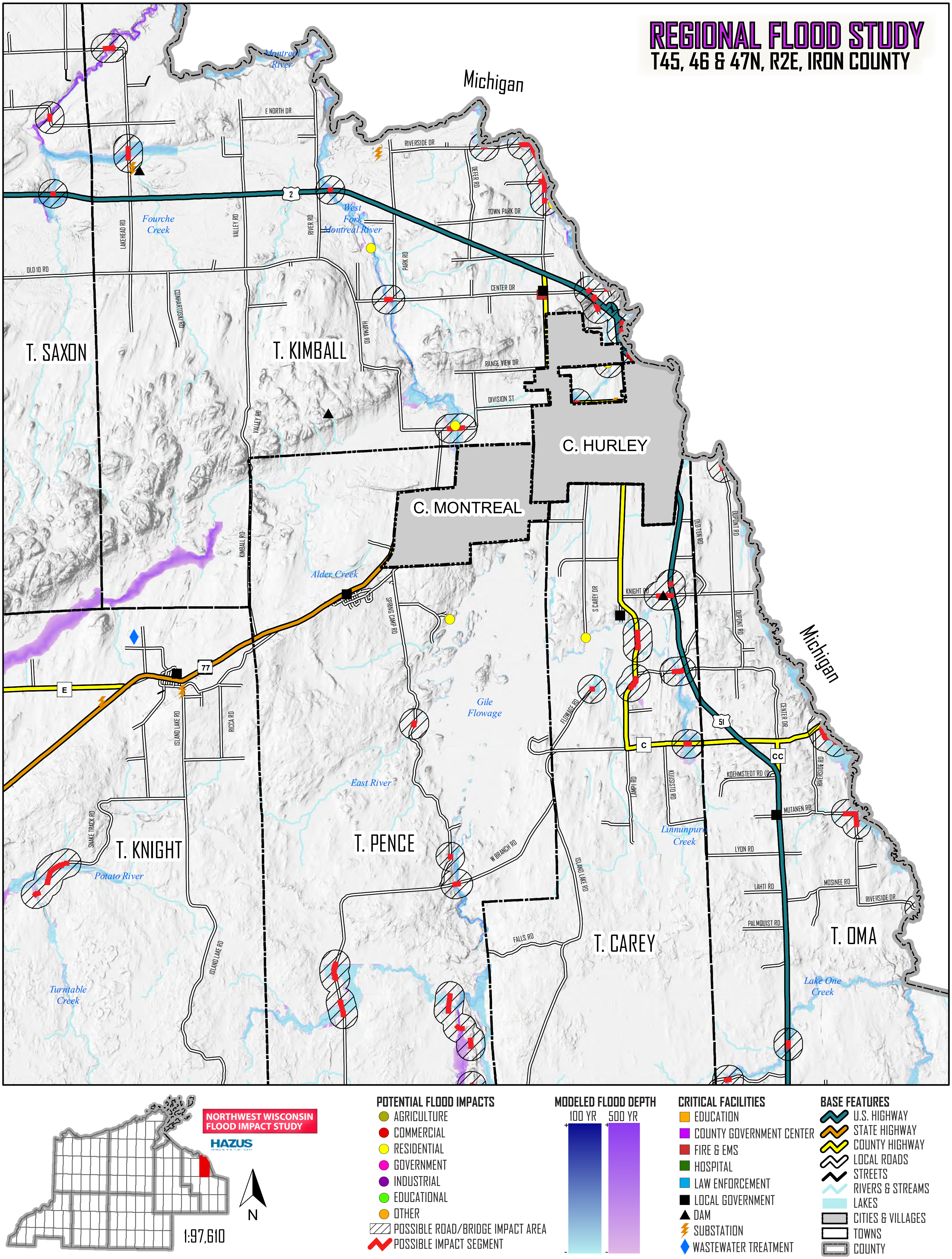
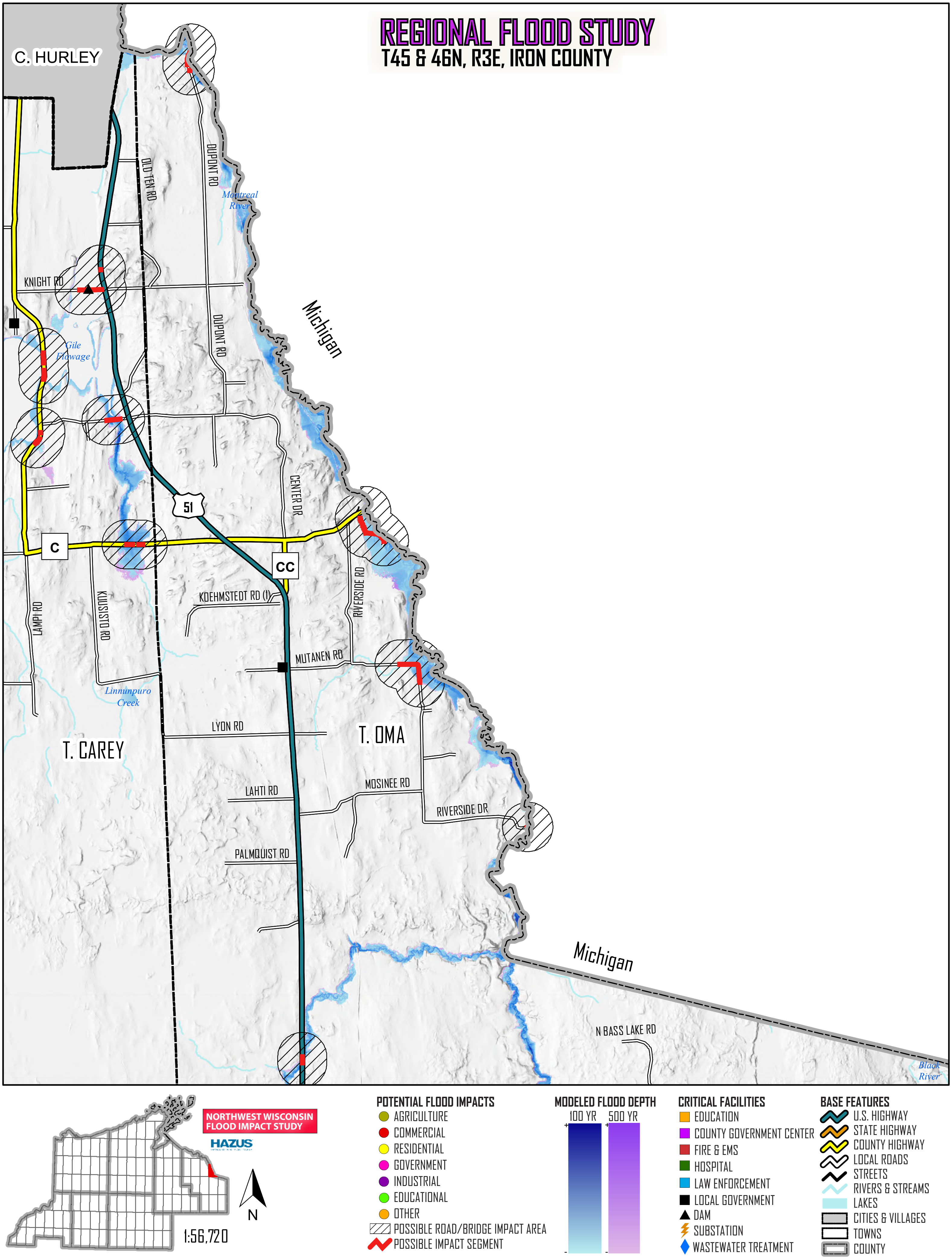
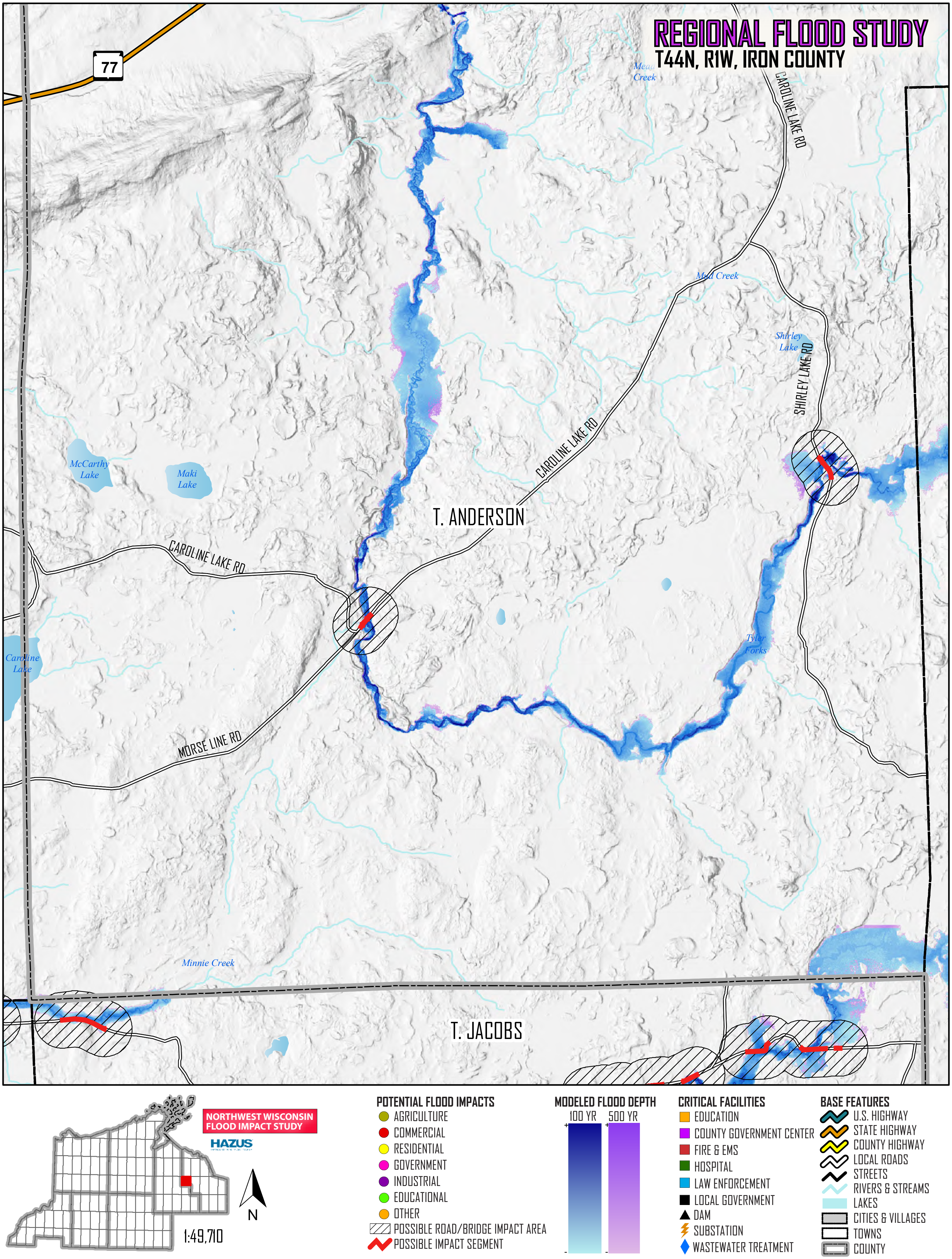

REGIONAL FLOOD STUDY
T45 & 46N, R1E, IRON COUNTY
T. SAXON
T. KIMBALL
T. GURNEY
C. MONTREAL
T. ANDERSON
T. PENCE
T. KNIGHT
SANDS RD
LOWER RD
UPPER RD
CARLSONS RD
CLEMENT RD
FREBURG RD
OLD 10 RD
LAKEHEAD RD
VALLEY RD
RIVER RD
RIVERSIDE DR
PARK RD
HARMA RD
CONHARTOSKI RD
MAGIERA RD
SULLIVAN RD
KIMBALL RD
SPRING CAMP RD
ISLAND LAKE RD
RICCA RD
SNAKE TRACK RD
CASEY SAG RD
CAROLINE LAKE RD
O BRIEN LAKE RD
B
E
2
122
77
Lawrence Creek
Beaver Pond
Mud Creek
Fourche Creek
Montreal River
West Fork Montreal River
Potato River
Weber Lake
Alder Creek
Upson Lake
Erickson Creek
Rouse Creek
Mead Creek
Turntable Creek
East River
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,970
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

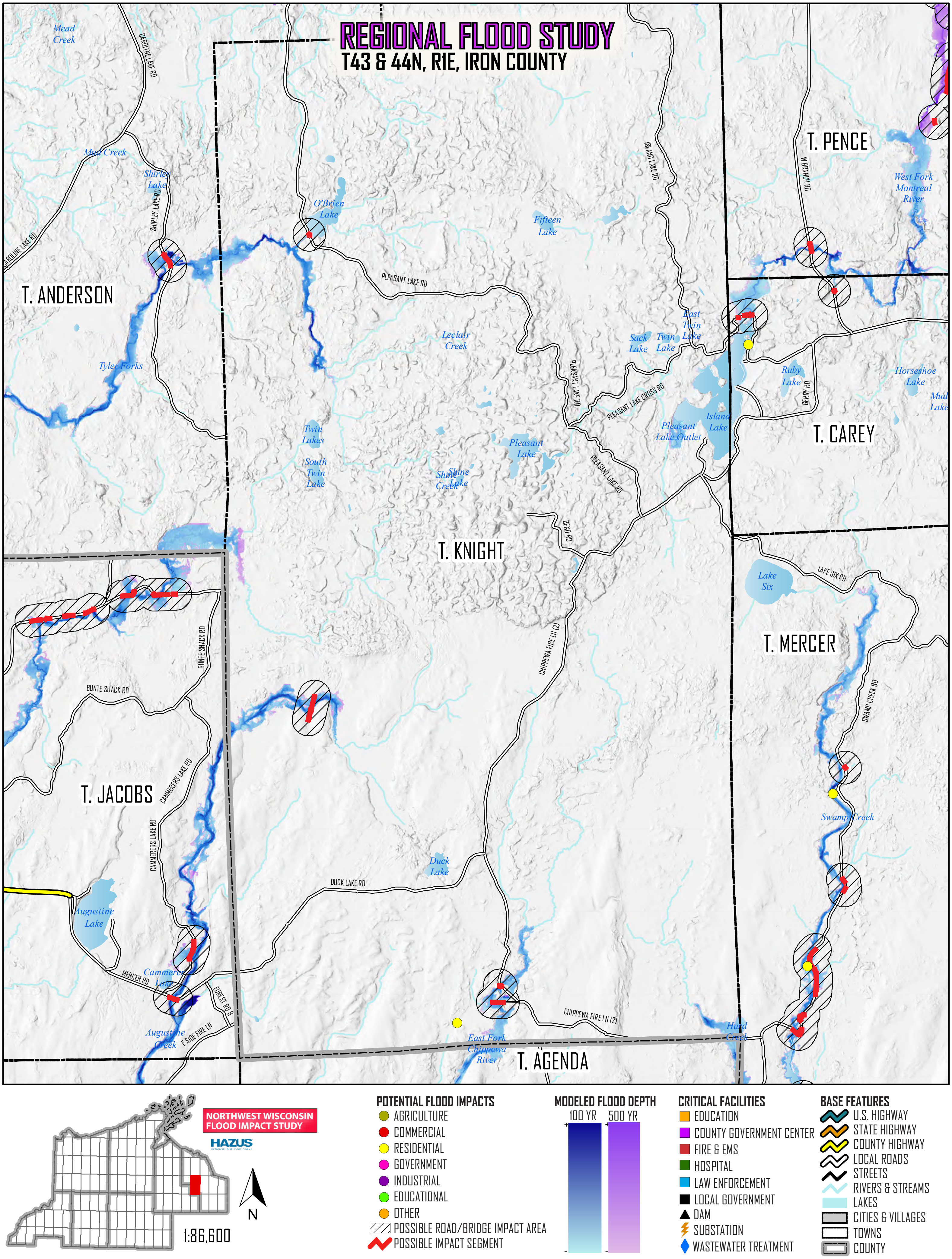


REGIONAL FLOOD STUDY
T45, 46 & 47N, R2E, IRON COUNTY
Michigan
Montreal River
E NORTH DR
RIVERSIDE DR
DEER RD
TOWN PARK DR
West Fork Montreal River
Fourche Creek
LAKEHEAD RD
VALLEY RD
RIVER RD
PARK RD
OLD 10 RD
CENTER DR
CONHARTOSKI RD
HARMA RD
RANGE VIEW DR
DIVISION ST
T. SAXON
T. KIMBALL
C. HURLEY
C. MONTREAL
KIMBALL RD
Alder Creek
SPRING CAMP RD
OLD TEN RD
DUPONT RD
KNIGHT RD
S CAREY DR
Michigan
E
77
2
51
C
CC
ISLAND LAKE RD
RICCA RD
Gile Flowage
FLOWAGE RD
CENTER DR
KOEHMSTEDT RD
RIVERSIDE RD
East River
LAMPI RD
KIVISISTO RD
MUTANEN RD
Linnunpuro Creek
LYON RD
SNAKE TRACK RD
T. KNIGHT
T. PENCE
W BRANCH RD
Potato River
LAHTI RD
MOSINEE RD
RIVERSIDE DR
PALMQUIST RD
T. OMA
FALLS RD
T. CAREY
Turntable Creek
Lake One Creek
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:97,610
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

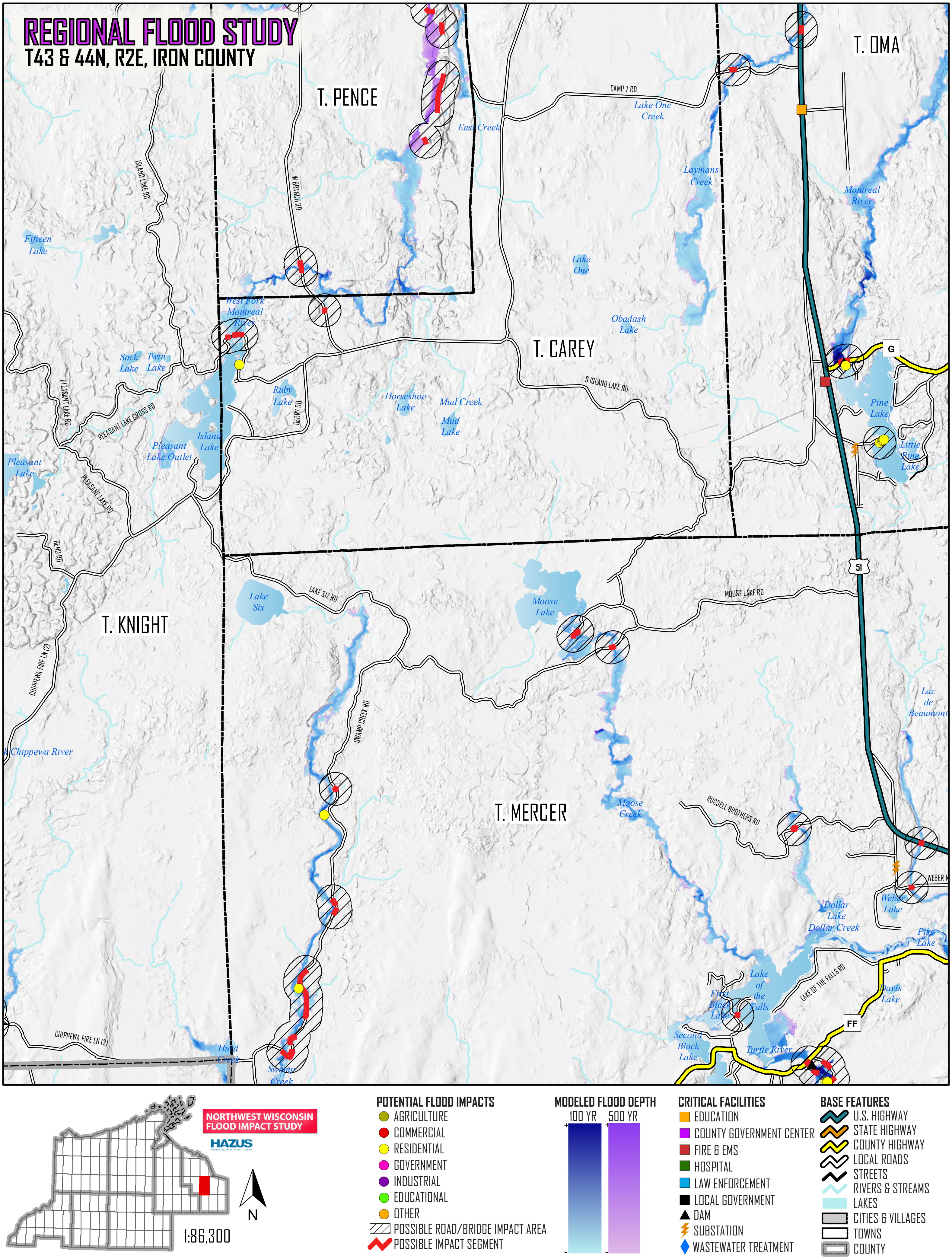


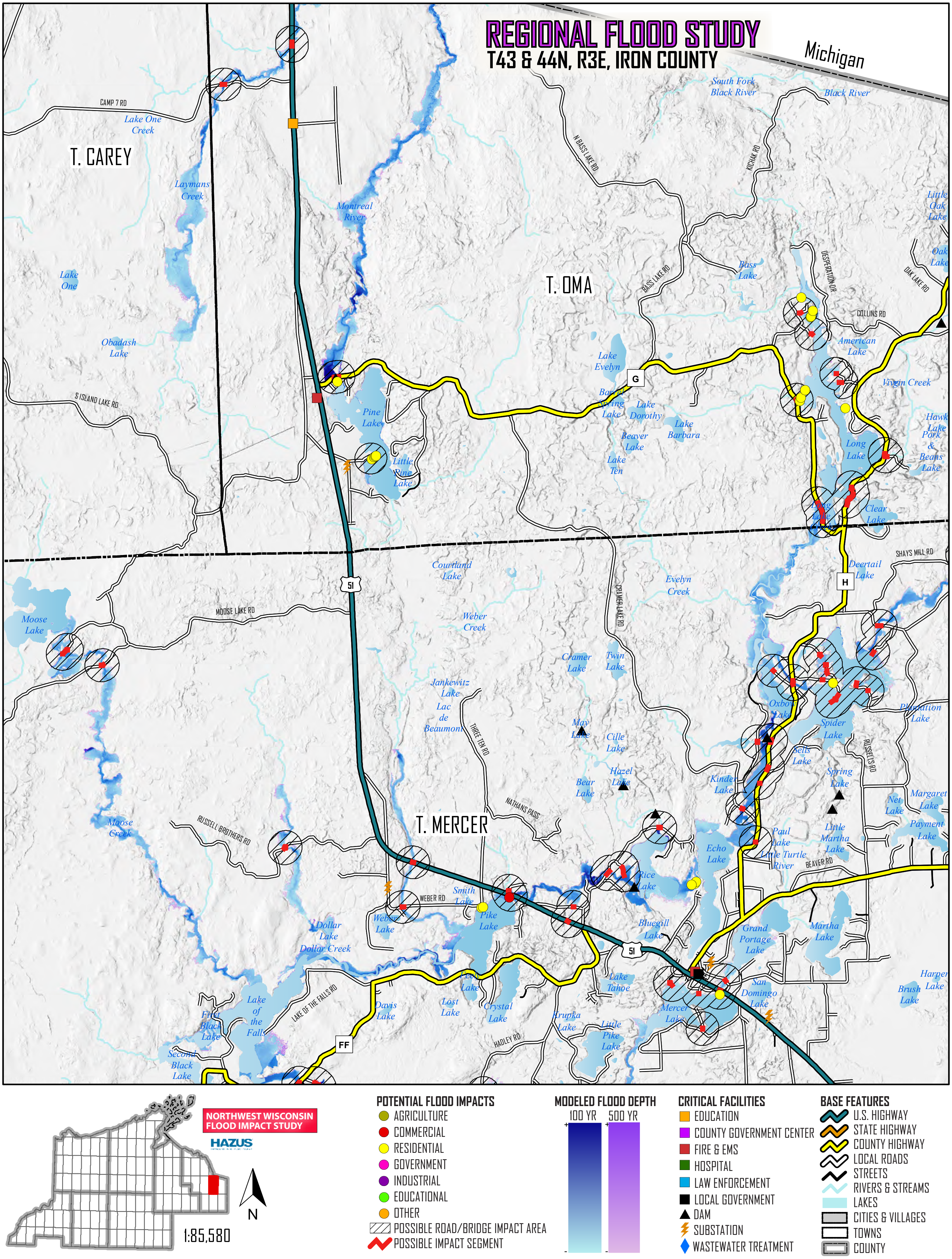
REGIONAL FLOOD STUDY
T45 & 46N, R3E, IRON COUNTY
C. HURLEY
OLD TEN RD
DUPONT RD
Montreal River
KNIGHT RD
Gile Flowage
Michigan
CENTER DR
51
C
CC
KOEHMSTEDT RD (I)
RIVERSIDE RD
LAMPI RD
KIUSISTO RD
MUTANEN RD
Linnunpuro Creek
LYON RD
T. OMA
T. CAREY
LAHTI RD
MOSINEE RD
RIVERSIDE DR
PALMQUIST RD
Michigan
N BASS LAKE RD
Black River
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:56,720
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T44N, R1W, IRON COUNTY
77
CAROLINE LAKE RD
SHIRLEY LAKE RD
MORSE LINE RD
T. ANDERSON
T. JACOBS
McCarthy Lake
Maki Lake
Caroline Lake
Shirley Lake
Mud Creek
Tyler Forks
Minnie Creek
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:49,710
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T43 & 44N, R1E, IRON COUNTY
T. ANDERSON
T. PENCE
T. CAREY
T. KNIGHT
T. MERCER
T. JACOBS
T. AGENDA
Mead Creek
Mud Creek
Shirley Lake
Tyler Forks
O'Brien Lake
Fifteen Lake
Leclair Creek
Sack Lake
Twin Lake
East Twin Lake
West Fork Montreal River
Ruby Lake
Horseshoe Lake
Mud Lake
Island Lake
Pleasant Lake Outlet
Pleasant Lake
Twin Lakes
South Twin Lake
Shine Creek
Shine Lake
Lake Six
Swamp Creek
Duck Lake
Augustine Lake
Cammerer Lake
Augustine Creek
East Fork Chippewa River
Hurd Creek
CAROLINE LAKE RD
SHIRLEY LAKE RD
PLEASANT LAKE RD
ISLAND LAKE RD
W BRANCH RD
PLEASANT LAKE CROSS RD
GERRY RD
BEND RD
LAKE SIX RD
CHIPPEWA FIRE LN (2)
SWAMP CREEK RD
BUNTE SHACK RD
CAMMERERS LAKE RD
DUCK LAKE RD
MERCER RD
FOREST RD 9
E SIDE FIRE LN
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,600
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T43 & 44N, R2E, IRON COUNTY
T. PENCE
T. CAREY
T. OMA
T. KNIGHT
T. MERCER
CAMP 7 RD
Lake One Creek
East Creek
Laymans Creek
Montreal River
ISLAND LAKE RD
W BRANCH RD
Fifteen Lake
Lake One
Obadash Lake
West Fork Montreal River
Sack Lake
Twin Lake
Ruby Lake
GERRY RD
Horseshoe Lake
Mud Creek
Mud Lake
S ISLAND LAKE RD
Pine Lake
Little Pine Lake
G
PLEASANT LAKE RD
PLEASANT LAKE CROSS RD
Pleasant Lake Outlet
Island Lake
Pleasant Lake
BEND RD
51
LAKE SIX RD
Lake Six
Moose Lake
MOOSE LAKE RD
CHIPPEWA FIRE LN (2)
Lac de Beaumont
SWAMP CREEK RD
Chippewa River
Moose Creek
RUSSELL BROTHERS RD
WEBER R
Weber Lake
Dollar Lake
Dollar Creek
Pike Lake
LAKE OF THE FALLS RD
Lake of the Falls
Davis Lake
First Black Lake
FF
Second Black Lake
Turtle River
Hurd Creek
Swamp Creek
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,300
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T43 & 44N, R3E, IRON COUNTY
Michigan
T. CAREY
T. OMA
T. MERCER
South Fork Black River
Black River
CAMP 7 RD
Lake One Creek
Laymans Creek
Montreal River
Lake One
Obadash Lake
S ISLAND LAKE RD
N BASS LAKE RD
KICHAK RD
BASS LAKE RD
DESPERATION DR
OAK LAKE RD
COLLINS RD
Little Oak Lake
Oak Lake
Bass Lake
American Lake
Virgin Creek
Hawk Lake
Pork & Beans Lake
Long Lake
Clear Lake
Lake Evelyn
Barrel Spring Lake
Lake Dorothy
Lake Barbara
Beaver Lake
Lake Ten
Pine Lake
Little Pine Lake
SHAYS MILL RD
Deertail Lake
Courtland Lake
Evelyn Creek
CRAMER LAKE RD
Moose Lake
MOOSE LAKE RD
Weber Creek
Cramer Lake
Twin Lake
Jankewitz Lake
Lac de Beaumont
THREE TEN RD
May Lake
Cille Lake
Hazel Lake
Bear Lake
Kinder Lake
Oxbow Lake
Spider Lake
Plantation Lake
Sells Lake
Spring Lake
RUSSETS RD
Margaret Lake
Net Lake
Payment Lake
Little Martha Lake
Paul Lake
Little Turtle River
BEAVER RD
Echo Lake
Rice Lake
NATHANS PASS
Moose Creek
RUSSELL BROTHERS RD
WEBER RD
Smith Lake
Pike Lake
Weber Lake
Dollar Lake
Dollar Creek
Bluegill Lake
Grand Portage Lake
Martha Lake
Lake Tahoe
San Domingo Lake
Mercer Lake
Harper Lake
Brush Lake
Lake of the Falls
LAKE OF THE FALLS RD
Davis Lake
Lost Lake
Crystal Lake
Krupka Lake
Little Pike Lake
HADLEY RD
First Black Lake
Second Black Lake
Fleck Lake
51
G
H
FF
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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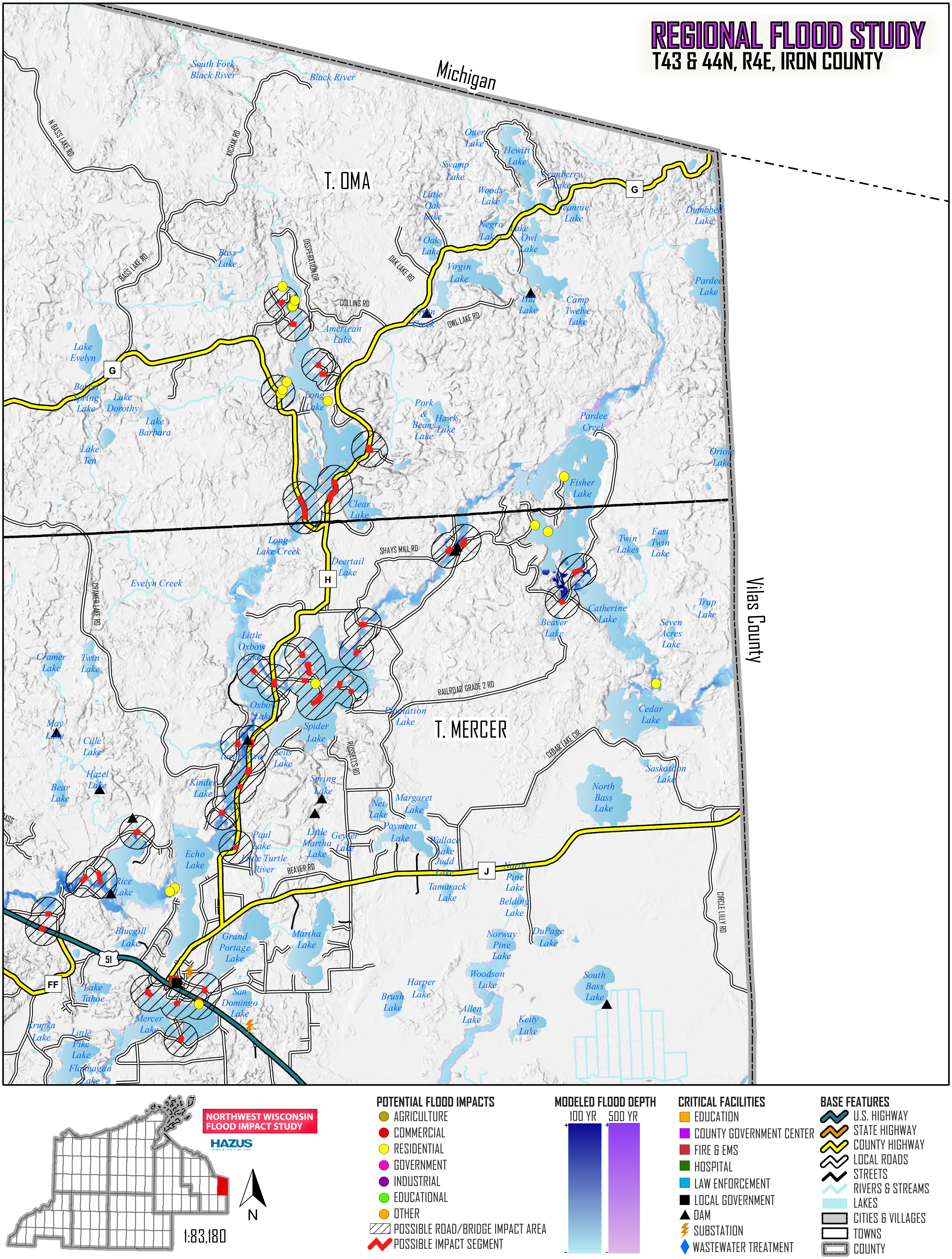
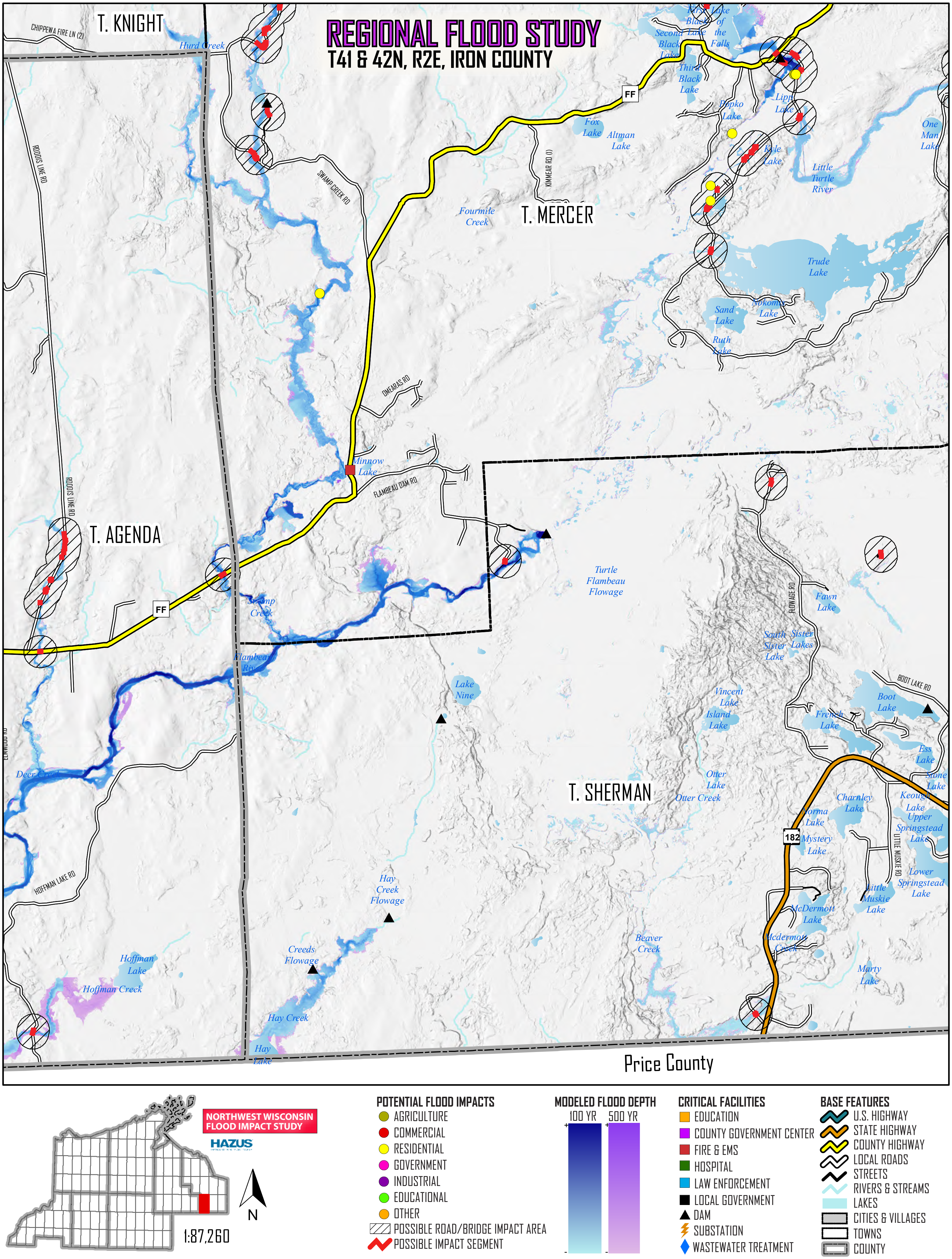
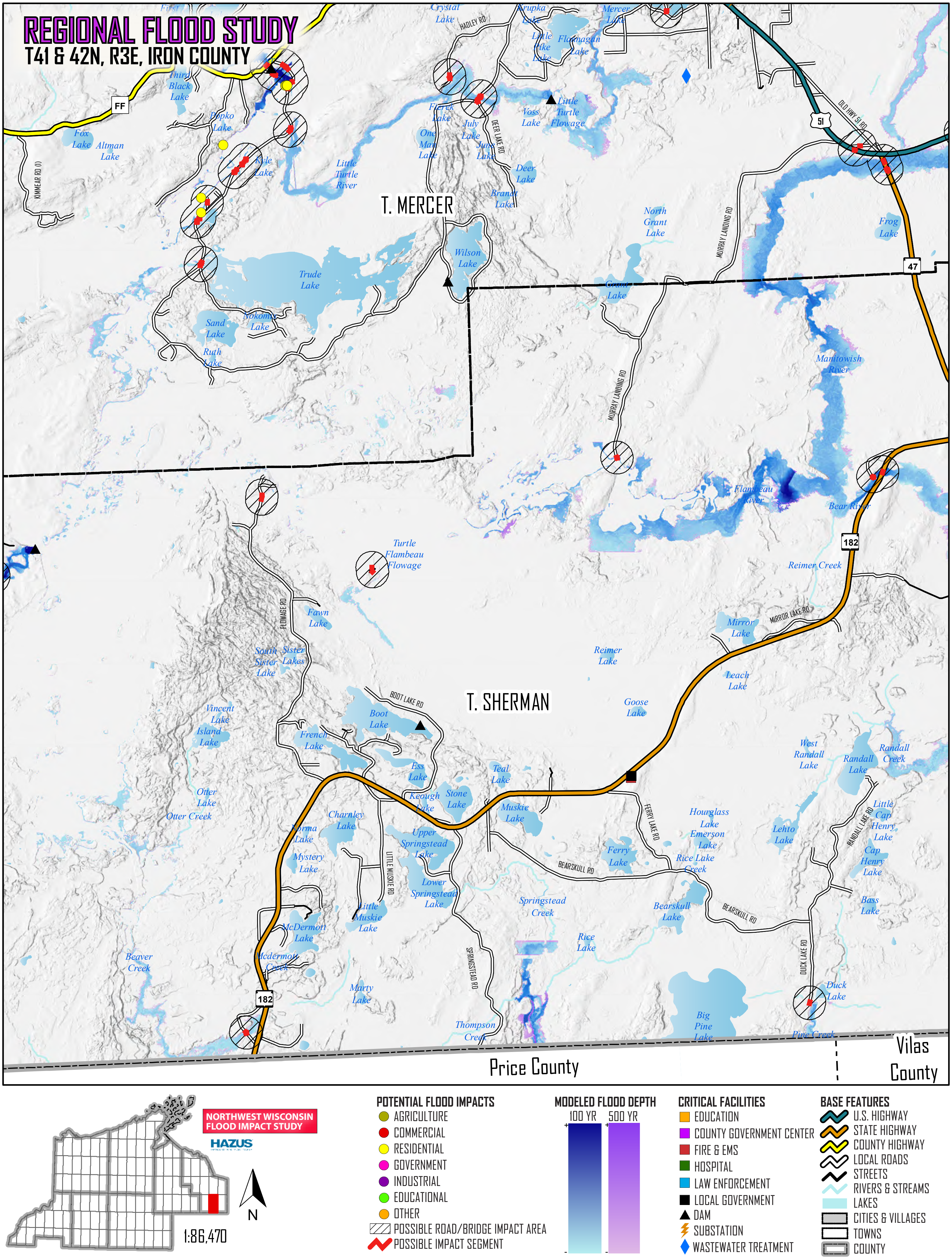


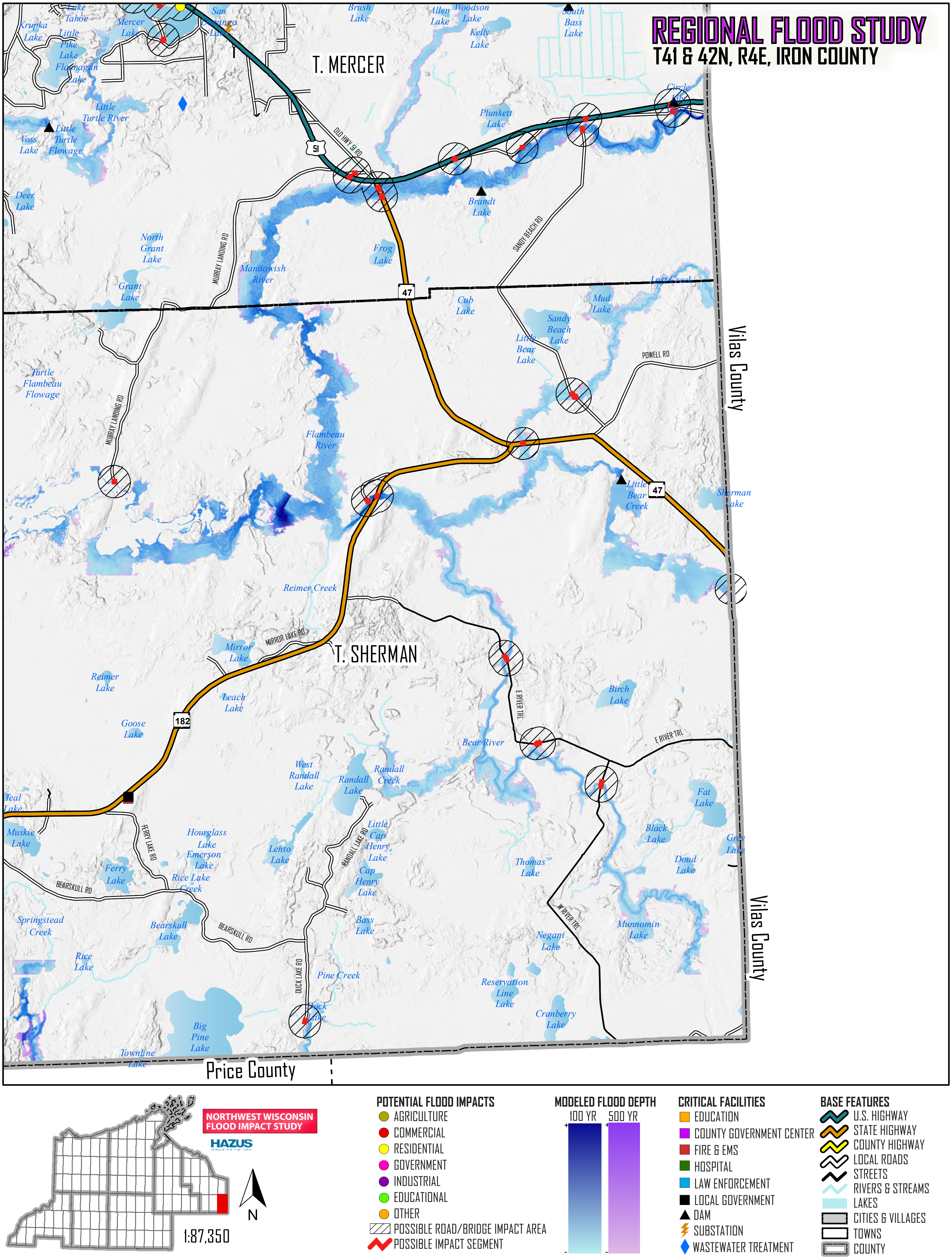
REGIONAL FLOOD STUDY
T43 & 44N, R4E, IRON COUNTY
Michigan
Vilas County
T. OMA
T. MERCER
South Fork Black River
Black River
N BASS LAKE RD
KICHAK RD
BASS LAKE RD
DESPERATION DR
OAK LAKE RD
COLLINS RD
OWL LAKE RD
SHAYS MILL RD
CRAMER LAKE RD
RAILROAD GRADE 2 RD
RUSSELLS RD
CEDAR LAKE CIR
BEAVER RD
CIRCLE LILLY RD
Otter Lake
Hewitt Lake
Swamp Lake
Cranberry Lake
Little Oak Lake
Woods Lake
Jeannie Lake
Dumbbell Lake
Negro Lake
Lake Owl Lake
Oak Lake
Bass Lake
Virgin Lake
Pardee Lake
Hill Lake
Camp Twelve Lake
Virgin Creek
American Lake
Lake Evelyn
Barrel Spring Lake
Lake Dorothy
Lake Barbara
Lake Ten
Long Lake
Pork & Beans Lake
Hawk Lake
Pardee Creek
Oriole Lake
Fisher Lake
Clear Lake
Long Lake Creek
Deertail Lake
Evelyn Creek
Twin Lakes
East Twin Lake
Catherine Lake
Beaver Lake
Trap Lake
Seven Acres Lake
Little Oxbow Lake
Oxbow Lake
Cramer Lake
Twin Lake
Plantation Lake
Cedar Lake
Spider Lake
May Lake
Cille Lake
Hazel Lake
Bear Lake
Turtle River
Sells Lake
Kinder Lake
Spring Lake
Net Lake
Margaret Lake
Saskatoon Lake
North Bass Lake
Paul Lake
Little Martha Lake
Geyser Lake
Payment Lake
Wallace Lake
Judd Lake
Echo Lake
Little Turtle River
North Pine Lake
Tamarack Lake
Belding Lake
Rice Lake
Bluegill Lake
Grand Portage Lake
Martha Lake
Norway Pine Lake
DuPage Lake
Woodson Lake
South Bass Lake
Lake Tahoe
San Domingo Lake
Harper Lake
Brush Lake
Allen Lake
Kelly Lake
Mercer Lake
Krupka Lake
Little Pike Lake
Flanagan Lake
G
H
J
FF
51
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:83,180
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T41 & 42N, R2E, IRON COUNTY
T. KNIGHT
T. MERCER
T. AGENDA
T. SHERMAN
Price County
Hurd Creek
Swamp Creek
Fourmile Creek
Minnow Lake
Turtle Flambeau Flowage
Flambeau River
Deer Creek
Hoffman Lake
Hoffman Creek
Lake Nine
Hay Creek Flowage
Creeds Flowage
Hay Creek
Hay Lake
Fox Lake
Altman Lake
Trude Lake
Sand Lake
Nokomis Lake
Ruth Lake
Little Turtle River
One Man Lake
Kyle Lake
Fawn Lake
South Sister Lake
Sister Lakes
Vincent Lake
Island Lake
Boot Lake
French Lake
Ess Lake
Stone Lake
Otter Lake
Otter Creek
Charnley Lake
Keough Lake
Upper Springstead Lake
Norma Lake
Mystery Lake
Lower Springstead Lake
Little Muskie Lake
McDermott Lake
Mcdermott Creek
Beaver Creek
Marty Lake
CHIPPEWA FIRE LN (2)
RODDIS LINE RD
SWAMP CREEK RD
KIMMEAR RD (1)
OMEARAS RD
FLAMBEAU DAM RD
HOFFMAN LAKE RD
FLOWAGE RD
BOOT LAKE RD
LITTLE MUSKIE RD
FF
182
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:87,260
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T41 & 42N, R3E, IRON COUNTY
T. MERCER
T. SHERMAN
Price County
Vilas County
Trude Lake
Wilson Lake
Sand Lake
Ruth Lake
Fox Lake
Altman Lake
Third Black Lake
Pipko Lake
Kyle Lake
Little Turtle River
Fierek Lake
One Man Lake
July Lake
June Lake
Deer Lake
Brandt Lake
Voss Lake
Little Turtle Flowage
Crystal Lake
Krupka Lake
Little Pike Lake
Flanagan Lake
Mercer Lake
North Grant Lake
Grand Lake
Frog Lake
Manitowish River
Flambeau River
Bear River
Turtle Flambeau Flowage
Reimer Creek
Mirror Lake
Reimer Lake
Leach Lake
Goose Lake
Fawn Lake
South Sister Lake
Sister Lakes
Vincent Lake
Island Lake
Otter Lake
Otter Creek
Boot Lake
French Lake
Ess Lake
Teal Lake
Keough Lake
Stone Lake
Muskie Lake
Charnley Lake
Norma Lake
Upper Springstead Lake
Lower Springstead Lake
Mystery Lake
Little Muskie Lake
McDermott Lake
Mcdermott Creek
Beaver Creek
Marty Lake
Thompson Creek
Springstead Creek
Rice Lake
Ferry Lake
Hourglass Lake
Emerson Lake
Rice Lake Creek
Bearskull Lake
Lehto Lake
West Randall Lake
Randall Lake
Randall Creek
Little Cap Henry Lake
Cap Henry Lake
Bass Lake
Duck Lake
Big Pine Lake
Pine Creek
HADLEY RD
DEER LAKE RD
KIMMEAR RD
MURRAY LANDING RD
FLOWAGE RD
BOOT LAKE RD
MIRROR LAKE RD
LITTLE MUSKIE RD
SPRINGSTEAD RD
FERRY LAKE RD
BEARSKULL RD
RANDALL LAKE RD
DUCK LAKE RD
OLD HWY 51 RD
FF
51
47
182
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,470
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T41 & 42N, R4E, IRON COUNTY
T. MERCER
T. SHERMAN
Vilas County
Vilas County
Price County
Lake Tahoe
Krupka Lake
Mercer Lake
San Domingo Lake
Little Pike Lake
Flannagan Lake
Brush Lake
Allen Lake
Woodson Lake
Kelly Lake
South Bass Lake
Circle Lily Lake
Little Turtle River
Little Turtle Flowage
Voss Lake
Plunkett Lake
Deer Lake
Brandt Lake
North Grant Lake
Grant Lake
Manitowish River
Frog Lake
Lost Creek
Cub Lake
Mud Lake
Sandy Beach Lake
Little Bear Lake
Turtle Flambeau Flowage
Flambeau River
Little Bear Creek
Sherman Lake
Reimer Creek
Mirror Lake
Reimer Lake
Leach Lake
Goose Lake
Birch Lake
Bear River
West Randall Lake
Randall Lake
Randall Creek
Teal Lake
Muskie Lake
Hourglass Lake
Emerson Lake
Rice Lake Creek
Ferry Lake
Lehto Lake
Little Cap Henry Lake
Cap Henry Lake
Thomas Lake
Fat Lake
Black Lake
Grey Lake
Doud Lake
Springstead Creek
Bearskull Lake
Bass Lake
Negani Lake
Munnomin Lake
Rice Lake
Pine Creek
Duck Lake
Reservation Line Lake
Cranberry Lake
Big Pine Lake
Townline Lake
51
47
182
OLD HWY 51 RD
MURRAY LANDING RD
SANDY BEACH RD
POWELL RD
MIRROR LAKE RD
E RIVER TRL
FERRY LAKE RD
BEARSKULL RD
RANDALL LAKE RD
W RIVER TRL
DUCK LAKE RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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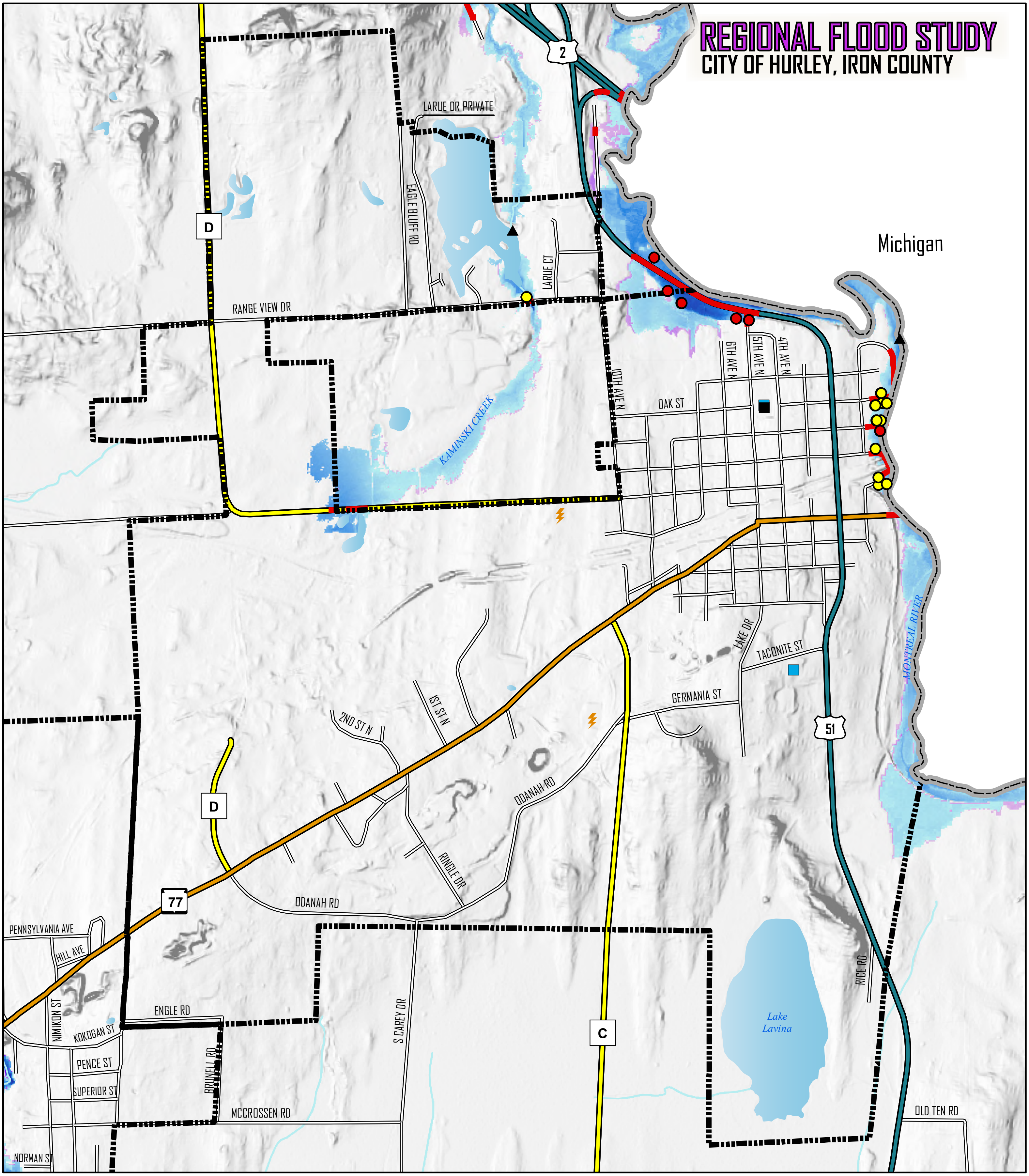
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



NORTHWEST WISCONSIN FLOOD IMPACT STUDY

HAZUS

N

1:20,180

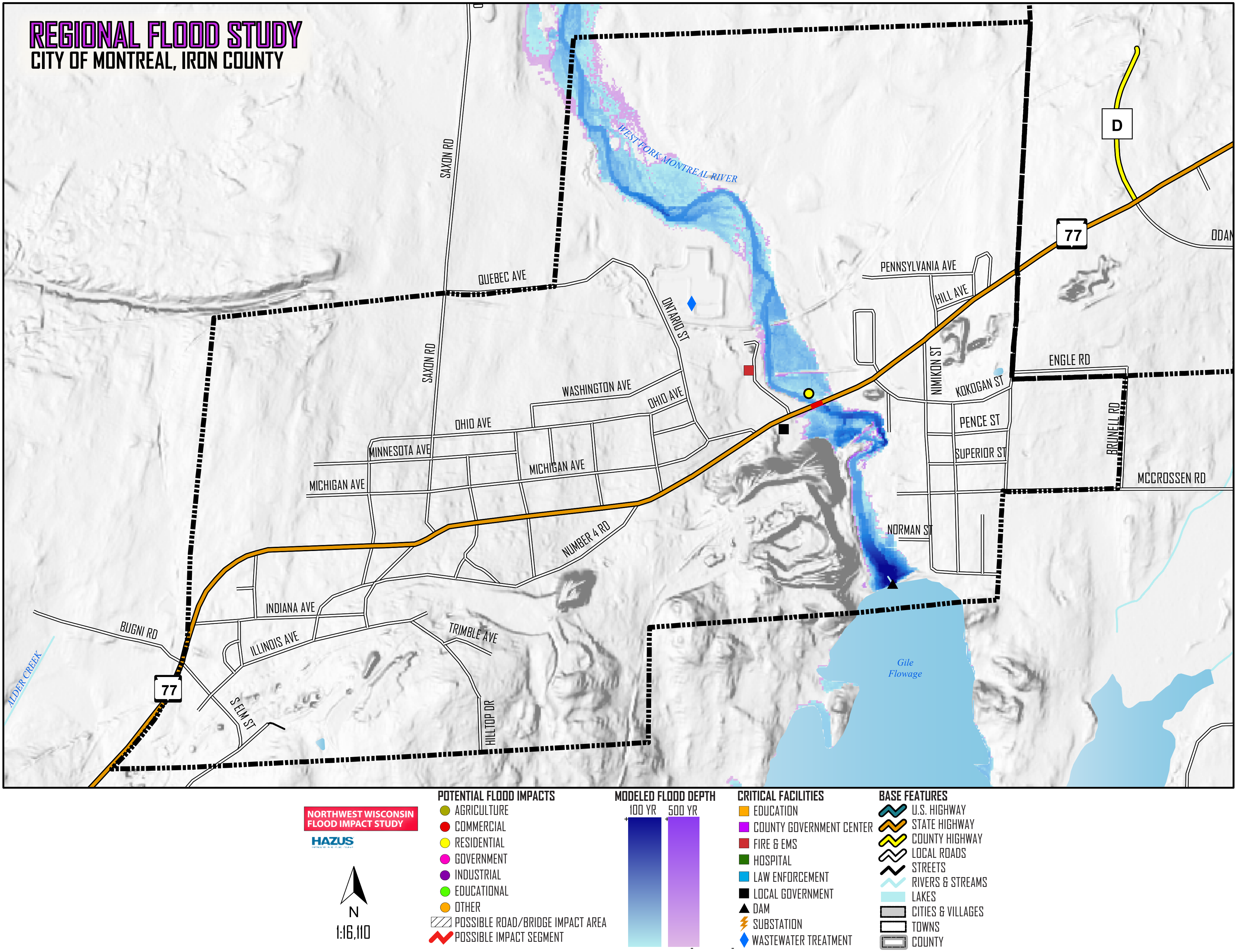
POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH

100 YR 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY


REGIONAL FLOOD STUDY
CITY OF MONTREAL, IRON COUNTY
WEST FORK MONTREAL RIVER
SAXON RD
QUEBEC AVE
ONTARIO ST
WASHINGTON AVE
OHIO AVE
MINNESOTA AVE
MICHIGAN AVE
NUMBER 4 RD
INDIANA AVE
ILLINOIS AVE
TRIMBLE AVE
BUGNI RD
SELM ST
HILLTOP DR
ALDER CREEK
PENNSYLVANIA AVE
HILL AVE
NIMIKON ST
KOKOGAN ST
PENCE ST
SUPERIOR ST
NORMAN ST
ENGLE RD
BRUNELL RD
MCCROSSEN RD
ODAN
D
77
Gile Flowage
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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1:16,110
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

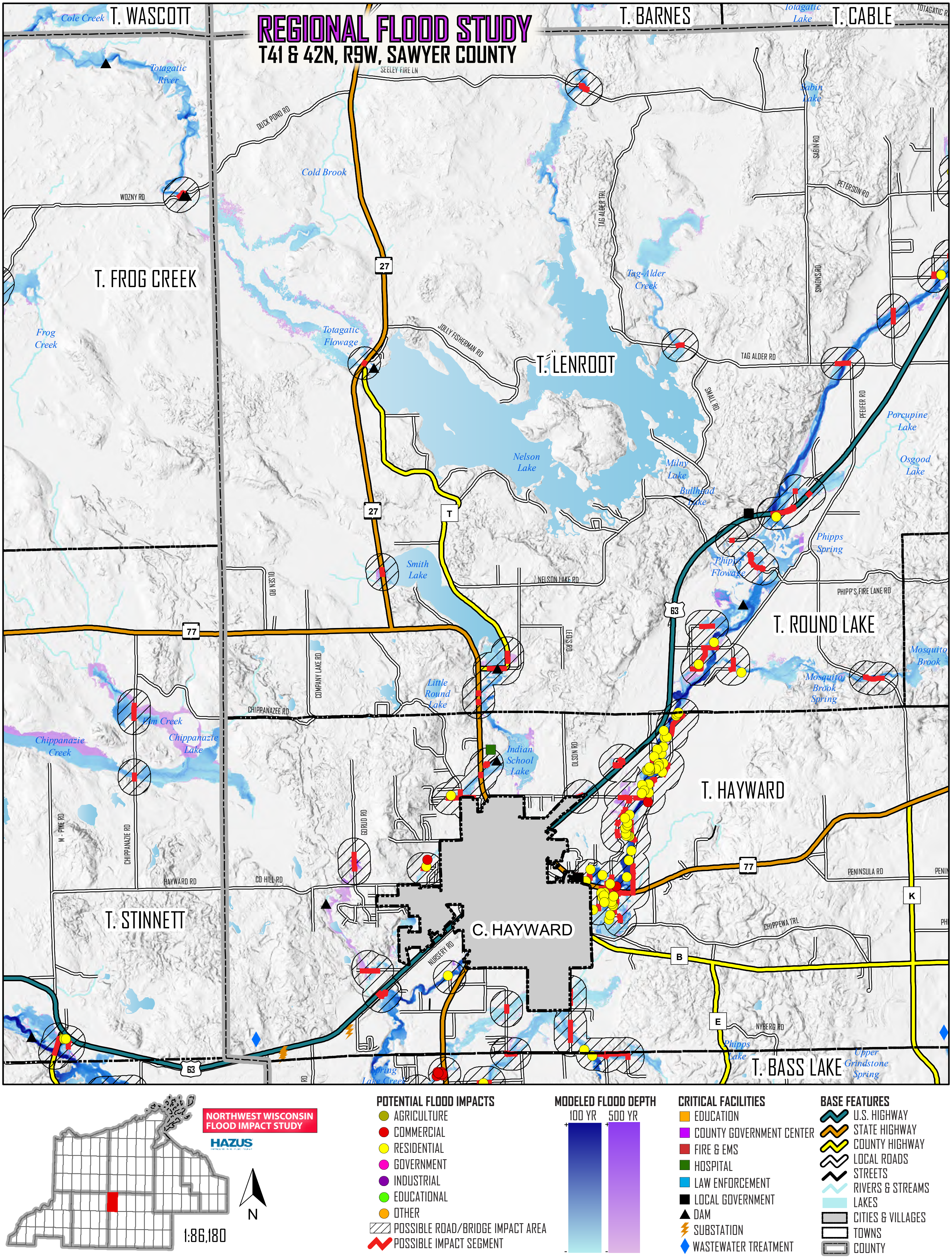
SAWYER COUNTY

HAZUS 100-YEAR FLOOD LOSS ESTIMATES - SAWYER COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF HAYWARD	74	$ 737,521.00	$ 1,198,313.00	$ 54,855.00	1,148
T. OF BASS LAKE	17	$ 217,456.00	$ 132,725.00	$ -	79
T. OF COUDERAY	10	$ 124,348.00	$ 52,225.00	$ -	238
T. OF DRAPER	27	$ 423,219.00	$ 225,693.00	$ -	396
T. OF EDGEWATER	1	$ 12,699.00	$ 4,590.00	$ -	22
T. OF HAYWARD	54	$ 1,431,369.00	$ 1,085,157.00	$ 150,064.00	799
T. OF HUNTER	22	$ 278,549.00	$ 359,083.00	$ -	196
T. OF LENROOT	8	$ 219,409.00	$ 114,158.00	$ -	146
T. OF OJIBWA	65	$ 1,625,699.00	$ 1,046,697.00	$ -	1,166
T. OF RADISSON	28	$ 578,273.00	$ 630,180.00	$ -	365
T. OF ROUND LAKE	19	$ 291,070.00	$ 171,627.00	$ -	207
T. OF SAND LAKE	1	$ 21,721.00	$ 6,400.00	$ -	35
T. OF SPIDER LAKE	10	$ 185,065.00	$ 81,159.00	$ -	189
T. OF WEIRGOR	32	$ 961,916.00	$ 445,413.00	$ -	715
T. OF WINTER	24	$ 522,158.00	$ 291,376.00	$ -	268
V. OF COUDERAY	1	$ 3,533.00	$ 2,370.00	$ -	18
V. OF EXELAND	3	$ 6,831.00	$ 20,223.00	$ -	14
GRAND TOTAL	**396**	**$ 7,640,836.00**	**$ 5,867,389.00**	**$ 204,919.00**	**6,001**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - SAWYER COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF HAYWARD	89	$ 1,078,738.00	$ 2,090,656.00	$ 99,341.00	1,259
T. OF BASS LAKE	21	$ 790,190.00	$ 448,629.00	$ -	163
T. OF COUDERAY	10	$ 139,435.00	$ 55,820.00	$ -	271
T. OF DRAPER	30	$ 492,648.00	$ 256,883.00	$ -	444
T. OF EDGEWATER	5	$ 101,125.00	$ 83,522.00	$ -	1,665
T. OF HAYWARD	59	$ 1,562,087.00	$ 1,070,954.00	$ 219,068.00	916
T. OF HUNTER	22	$ 350,745.00	$ 471,898.00	$ -	216
T. OF LENROOT	11	$ 260,454.00	$ 135,519.00	$ -	205
T. OF OJIBWA	77	$ 3,290,933.00	$ 1,874,476.00	$ -	4,188
T. OF RADISSON	40	$ 1,104,390.00	$ 958,279.00	$ -	903
T. OF ROUND LAKE	32	$ 434,130.00	$ 245,134.00	$ -	389
T. OF SAND LAKE	1	$ 20,748.00	$ 6,319.00	$ -	35
T. OF SPIDER LAKE	11	$ 225,678.00	$ 101,805.00	$ -	200
T. OF WEIRGOR	34	$ 1,251,924.00	$ 574,025.00	$ -	805
T. OF WINTER	29	$ 757,348.00	$ 451,975.00	$ -	363
V. OF COUDERAY	1	$ 5,669.00	$ 3,663.00	$ -	18
V. OF EXELAND	3	$ 8,535.00	$ 28,266.00	$ -	14
GRAND TOTAL	**475**	**$ 11,874,777.00**	**$ 8,857,823.00**	**$ 318,409.00**	**12,054**


REGIONAL FLOOD STUDY
T41 & 42N, R9W, SAWYER COUNTY
T. WASCOTT
T. BARNES
T. CABLE
T. FROG CREEK
T. LENROOT
T. ROUND LAKE
T. HAYWARD
T. STINNETT
T. BASS LAKE
C. HAYWARD
Cole Creek
Totagatic River
Totagatic Lake
Sabin Lake
Cold Brook
Tag-Alder Creek
Totagatic Flowage
Frog Creek
Nelson Lake
Milny Lake
Bullhead Lake
Porcupine Lake
Osgood Lake
Phipps Spring
Phipps Flowage
Smith Lake
Mosquito Brook
Mosquito Brook Spring
Little Round Lake
Elm Creek
Chippanazie Creek
Chippanazie Lake
Indian School Lake
Phipps Lake
Upper Grindstone Spring
Spring Lake Creek
SEELEY FIRE LN
DUCK POND RD
WOZNY RD
JOLLY FISHERMAN RD
TAG ALDER TRL
TAG ALDER RD
SMALL RD
SABIN RD
SIMONS RD
PETERSON RD
PFEIFER RD
NELSON LAKE RD
PHIPP'S FIRE LANE RD
OLSEN RD
LEO'S RD
COMPANY LAKE RD
CHIPPANAZEE RD
OLSON RD
GORUD RD
CO HILL RD
HAYWARD RD
CHIPPANAZIE RD
M - PIKE RD
NURSERY RD
CHIPPEWA TRL
PENINSULA RD
NYBERG RD
27
77
63
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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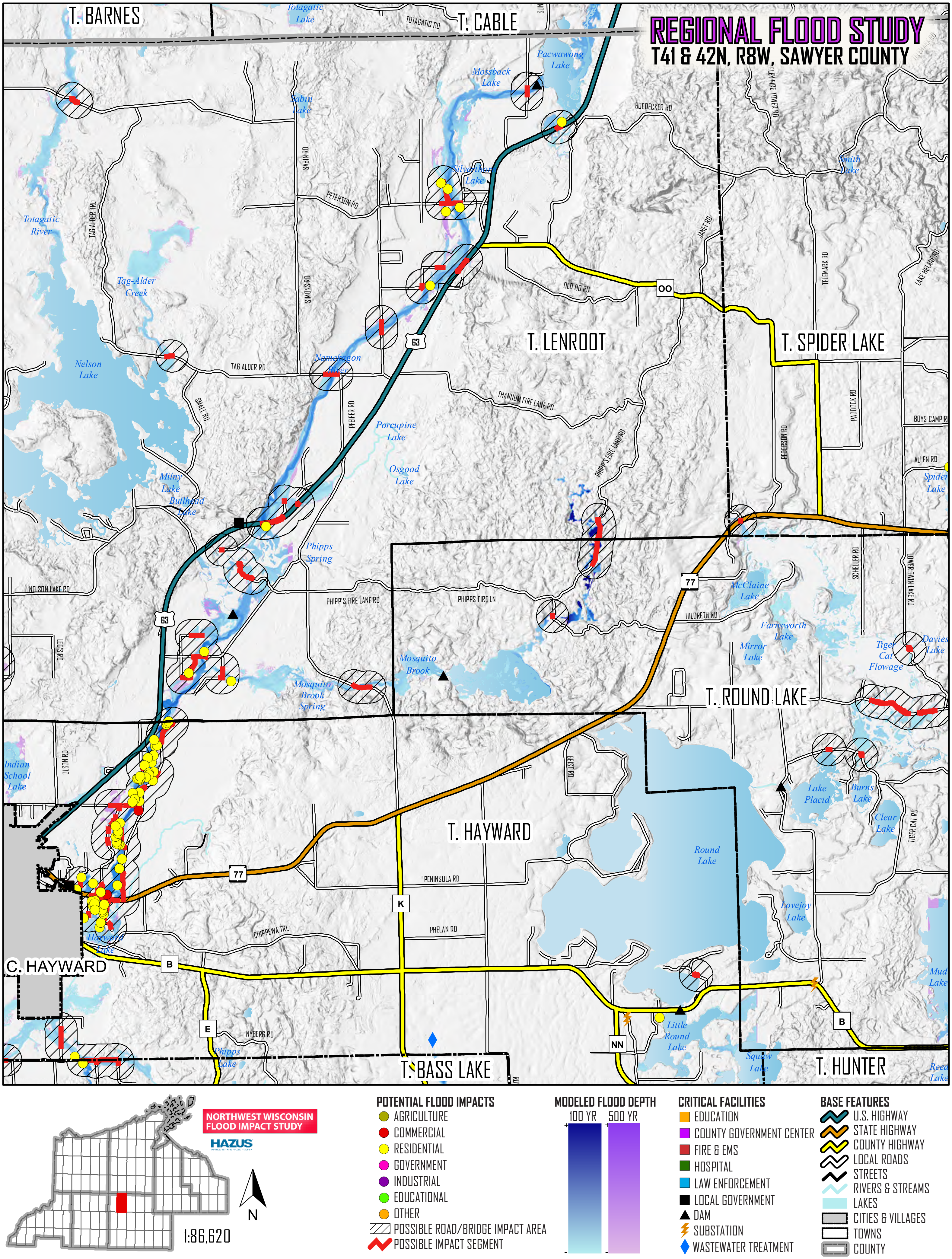
REGIONAL FLOOD STUDY
T41 & 42N, R8W, SAWYER COUNTY
T. BARNES
T. CABLE
T. LENROOT
T. SPIDER LAKE
T. ROUND LAKE
T. HAYWARD
T. BASS LAKE
T. HUNTER
C. HAYWARD
Totagatic Lake
Pacwawong Lake
Mossback Lake
Sabin Lake
Silverthorn Lake
Totagatic River
Tag-Alder Creek
Nelson Lake
Namakagon River
Porcupine Lake
Osgood Lake
Milny Lake
Bullhead Lake
Phipps Spring
Mosquito Brook
Mosquito Brook Spring
Indian School Lake
Hayward Lake
McClaine Lake
Farnsworth Lake
Mirror Lake
Tiger Cat Flowage
Davies Lake
Spider Lake
Smith Lake
Lake Placid
Burns Lake
Clear Lake
Round Lake
Lovejoy Lake
Little Round Lake
Squaw Lake
Mud Lake
Reed Lake
Phipps Lake
TOTAGATIC RD
BOEDECKER RD
PETERSON RD
SABIN RD
SIMONS RD
TAG ALDER TRL
TAG ALDER RD
SMALL RD
PFEIFER RD
OLD OO RD
JANET RD
TELEMARK RD
LAKE HELANE RD
THANNUM FIRE LANE RD
PHIPP'S FIRE LANE RD
PHIPPS FIRE LN
PADDOCK RD
BOYS CAMP RD
ALLEN RD
PEDERSON RD
SCHELLER RD
TOWER TWIN LAKE RD
HILDRETH RD
NELSON LAKE RD
LEOS RD
OLSON RD
GEST RD
TIGER CAT RD
PENINSULA RD
PHELAN RD
CHIPPEWA TRL
NYBERG RD
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
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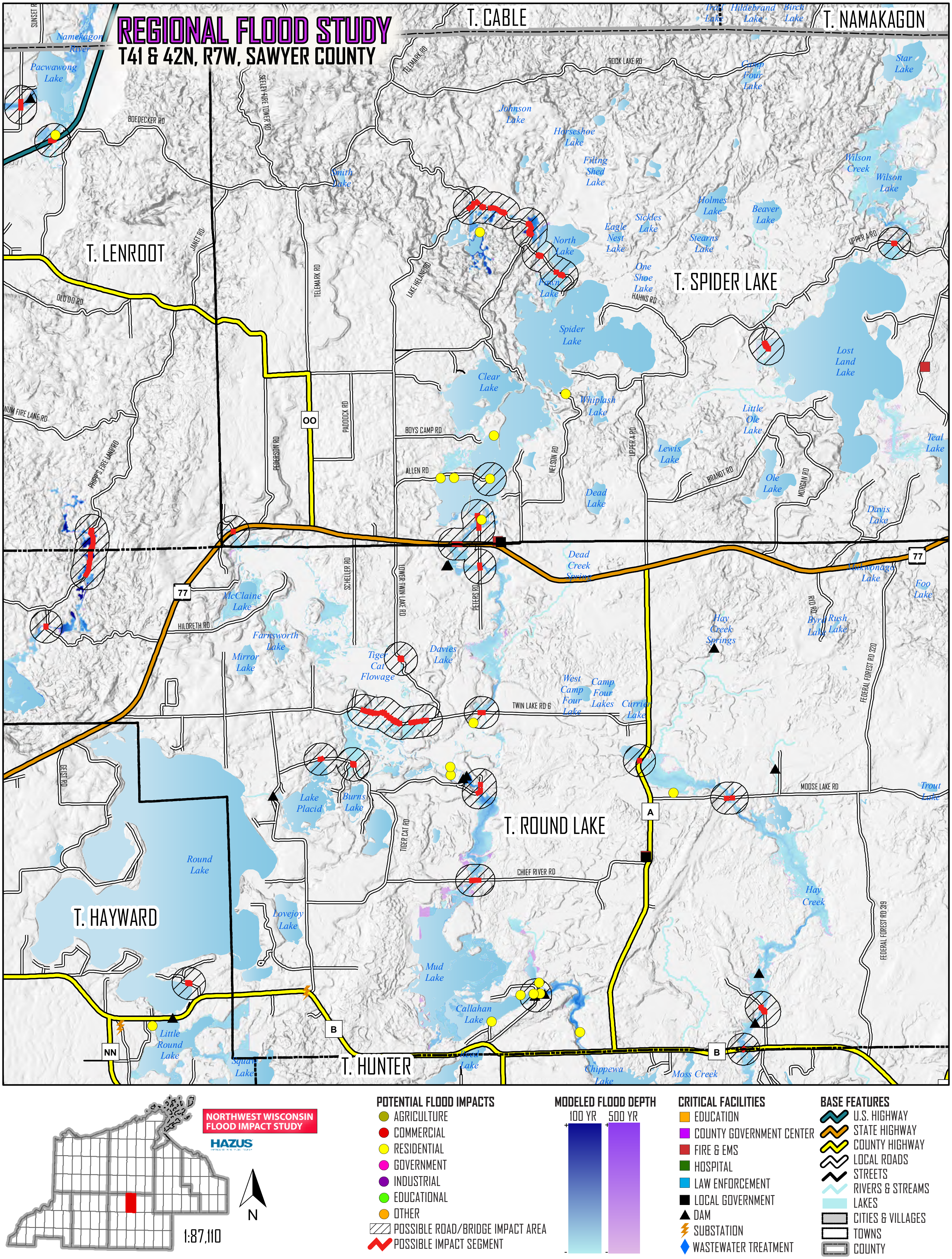
REGIONAL FLOOD STUDY
T41 & 42N, R7W, SAWYER COUNTY
T. CABLE
T. NAMAKAGON
T. LENROOT
T. SPIDER LAKE
T. ROUND LAKE
T. HAYWARD
T. HUNTER
Namekagon River
Pacwawong Lake
Johnson Lake
Horseshoe Lake
Filing Shed Lake
Smith Lake
Camp Four Lake
Star Lake
Wilson Creek
Wilson Lake
Holmes Lake
Beaver Lake
Sickles Lake
Eagle Nest Lake
Stearns Lake
North Lake
One Shoe Lake
Fawn Lake
Spider Lake
Lost Land Lake
Clear Lake
Whiplash Lake
Little Ole Lake
Teal Lake
Lewis Lake
Ole Lake
Dead Lake
Davis Lake
Dead Creek Springs
Mukwonago Lake
Foo Lake
McClaine Lake
Farnsworth Lake
Mirror Lake
Tiger Cat Flowage
Davies Lake
Hay Creek Springs
Byrd Lake
Rush Lake
West Camp Four Lake
Camp Four Lakes
Currier Lake
Lake Placid
Burns Lake
Trout Lake
Round Lake
Lovejoy Lake
Hay Creek
Mud Lake
Callahan Lake
Little Round Lake
Squaw Lake
Reed Lake
Chippewa Lake
Moss Creek
ROCK LAKE RD
TELEMARK RD
SEELEY FIRE TOWER RD
BOEDECKER RD
JANET RD
OLD OO RD
LAKE HELANE RD
UPPER A RD
HAHNS RD
BOYS CAMP RD
PADDOCK RD
PEDERSON RD
ALLEN RD
NELSON RD
BRANDT RD
MORGAN RD
PHIPPS FIRE LANE RD
SCHELLER RD
LOWER TWIN LAKE RD
PETERS RD
HILORETH RD
TWIN LAKE RD 6
RYD RD
FEDERAL FOREST RD 320
FEDERAL FOREST RD 319
MOOSE LAKE RD
TIGER CAT RD
CHIEF RIVER RD
GEIST RD
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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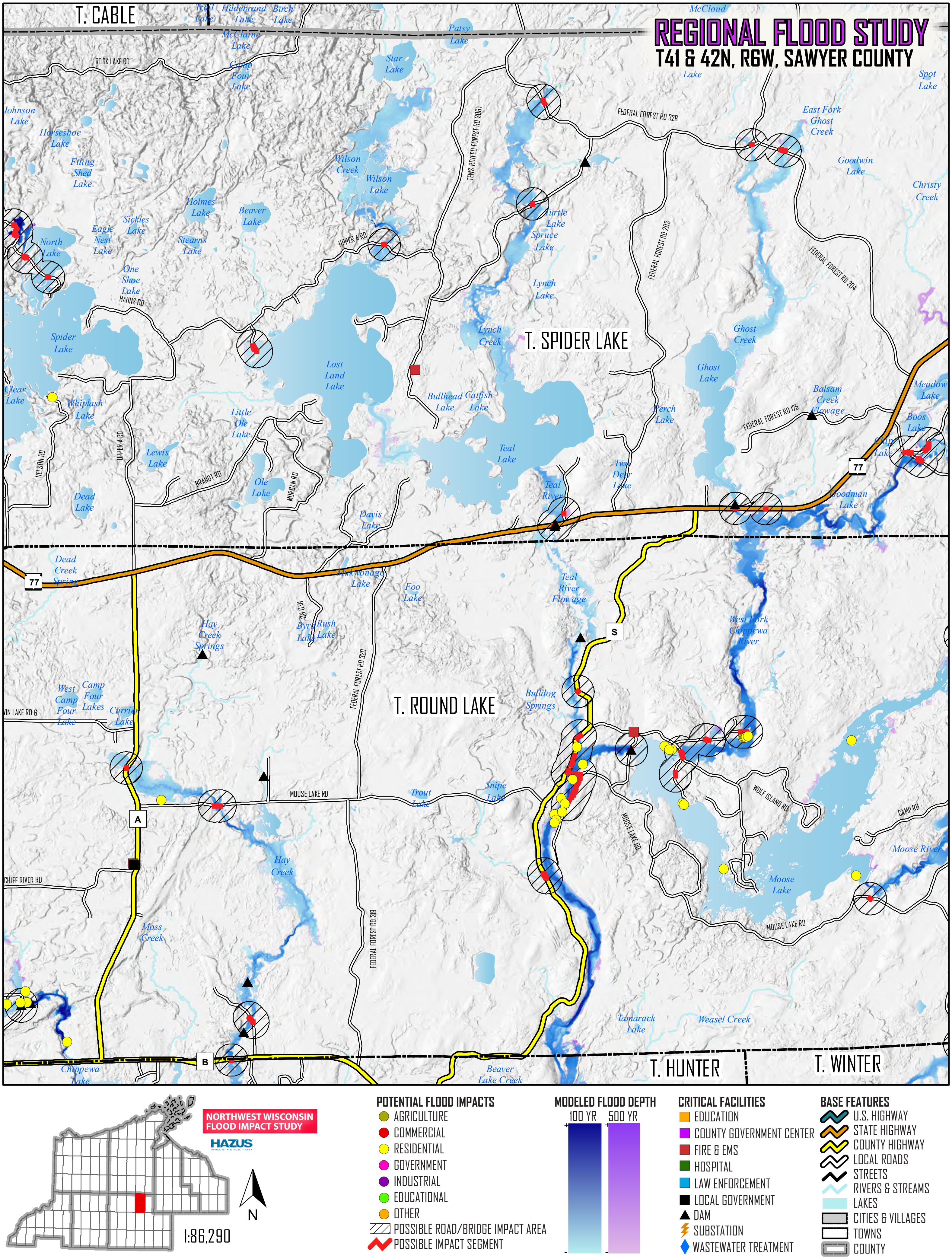
1:87,110
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R6W, SAWYER COUNTY
T. CABLE
T. SPIDER LAKE
T. ROUND LAKE
T. HUNTER
T. WINTER
ROCK LAKE RD
UPPER A RD
HAHNS RD
NELSON RD
BRANDT RD
MORGAN RD
FEDERAL FOREST RD 328
FEDERAL FOREST RD 203
FEDERAL FOREST RD 204
FEDERAL FOREST RD 175
TEWS RD(FED FOREST RD 206)
FEDERAL FOREST RD 320
FEDERAL FOREST RD 319
MOOSE LAKE RD
WOLF ISLAND RD
CAMP RD
CHIEF RIVER RD
77
A
B
S
Johnson Lake
Horseshoe Lake
Filing Shed Lake
Holmes Lake
Beaver Lake
Sickles Lake
Eagle Nest Lake
Stearns Lake
North Lake
One Shoe Lake
Spider Lake
Clear Lake
Whiplash Lake
Little Ole Lake
Lewis Lake
Ole Lake
Dead Lake
Lost Land Lake
Wilson Creek
Wilson Lake
Star Lake
Patsy Lake
McClaine Lake
Camp Four Lake
Hildebrand Lake
Birch Lake
McCloud Lake
Turtle Lake
Spruce Lake
Lynch Lake
Lynch Creek
Bullhead Lake
Catfish Lake
Teal Lake
Teal River
Two Deer Lake
Perch Lake
Ghost Lake
Ghost Creek
East Fork Ghost Creek
Goodwin Lake
Christy Creek
Spot Lake
Balsam Creek Flowage
Meadow Lake
Boos Lake
Goodman Lake
Davis Lake
Dead Creek Spring
Teal River Flowage
Foo Lake
Rush Lake
Hay Creek Springs
Hay Creek
West Fork Chippewa River
Bulldog Springs
West Camp Four Lake
Camp Four Lakes
Currier Lake
Trout Lake
Snipe Lake
Moose Lake
Moose River
Moss Creek
Tamarack Lake
Weasel Creek
Beaver Lake Creek
Chippewa Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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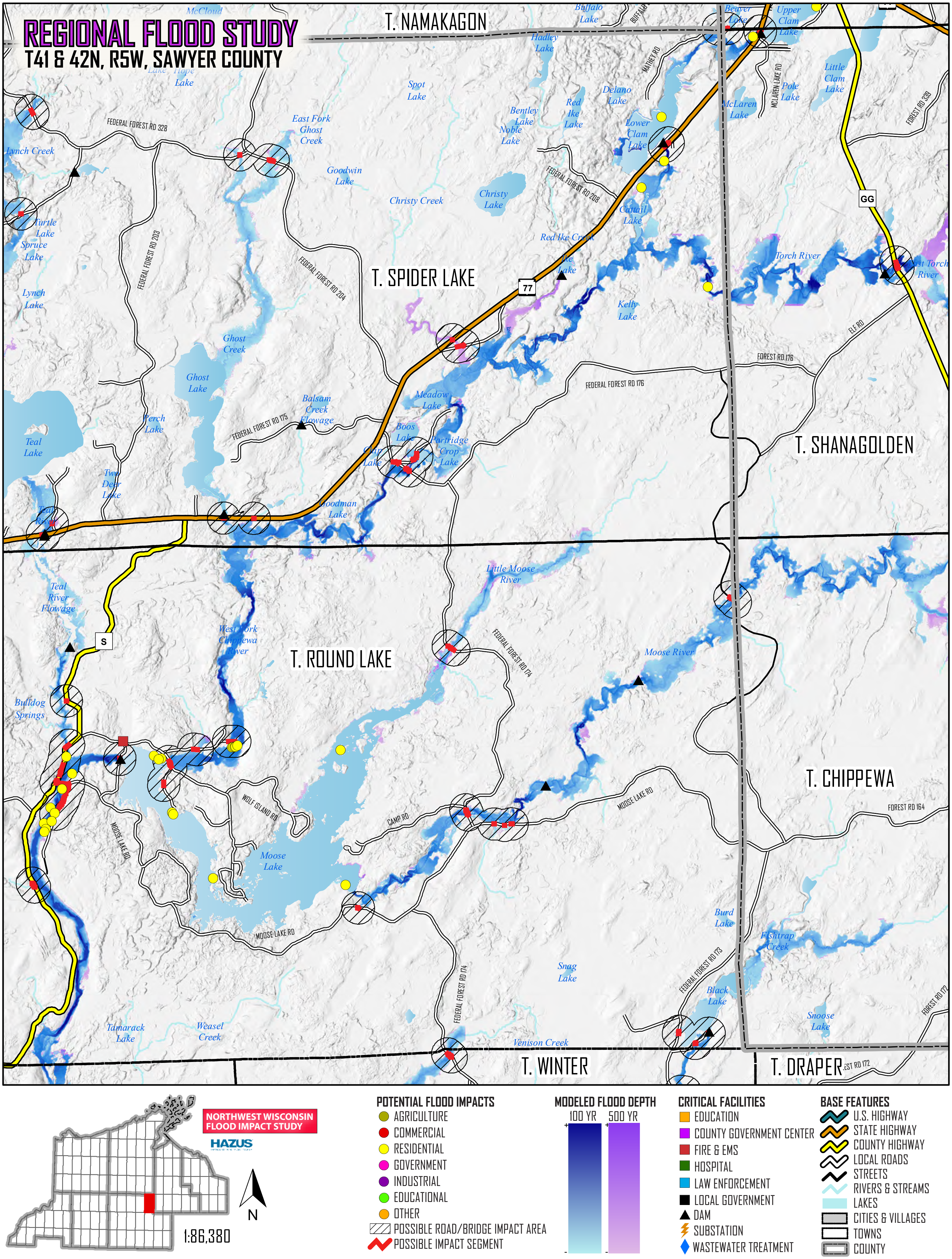
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R5W, SAWYER COUNTY
T. NAMAKAGON
T. SPIDER LAKE
T. SHANAGOLDEN
T. ROUND LAKE
T. CHIPPEWA
T. WINTER
T. DRAPER
McCloud
Hope Lake
Buffalo Lake
Beaver Lake
Upper Clam Lake
Hadley Lake
Spot Lake
Delano Lake
Red Ike Lake
Bentley Lake
Noble Lake
Lower Clam Lake
McLaren Lake
Pole Lake
Little Clam Lake
East Fork Ghost Creek
Goodwin Lake
Lynch Creek
Turtle Lake
Spruce Lake
Christy Creek
Christy Lake
Cattail Lake
Red Ike Creek
Ike Lake
Torch River
East Torch River
Kelly Lake
Lynch Lake
Ghost Creek
Ghost Lake
Balsam Creek Flowage
Meadow Lake
Boos Lake
Partridge Crop Lake
Clear Lake
Perch Lake
Teal Lake
Two Deer Lake
Teal River
Goodman Lake
Teal River Flowage
Little Moose River
West Fork Chippewa River
Moose River
Bulldog Springs
Moose Lake
Burd Lake
Fishtrap Creek
Snag Lake
Black Lake
Snoose Lake
Tamarack Lake
Weasel Creek
Venison Creek
FEDERAL FOREST RD 328
FEDERAL FOREST RD 203
FEDERAL FOREST RD 204
FEDERAL FOREST RD 208
FEDERAL FOREST RD 175
FEDERAL FOREST RD 176
FOREST RD 176
FEDERAL FOREST RD 174
FEDERAL FOREST RD 173
FOREST RD 164
FOREST RD 172
FOREST RD 339
MATHEY RD
MCLAREN LAKE RD
ELF RD
WOLF ISLAND RD
MOOSE LAKE RD
CAMP RD
77
GG
S
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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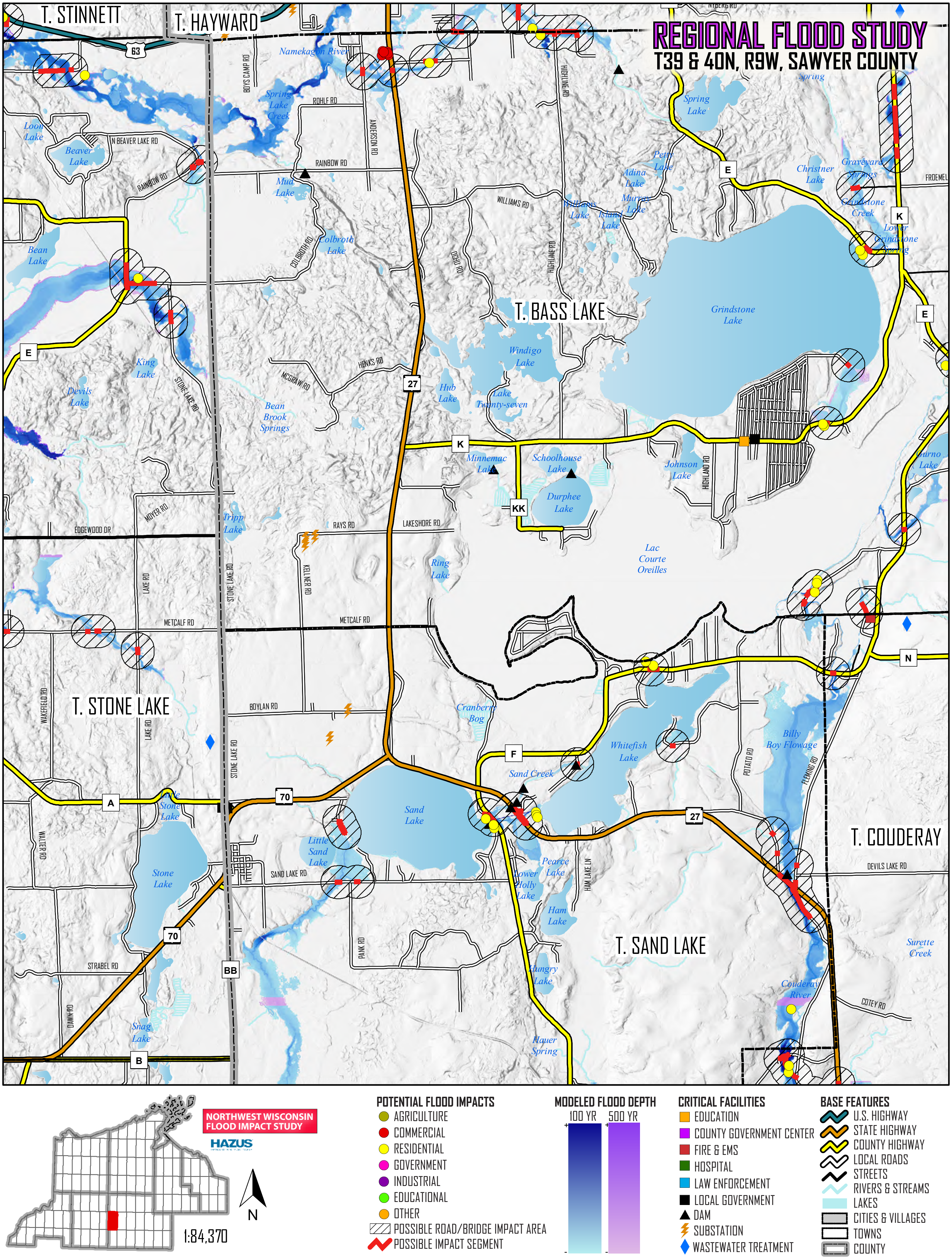
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T39 & 40N, R9W, SAWYER COUNTY
T. STINNETT
T. HAYWARD
T. BASS LAKE
T. STONE LAKE
T. SAND LAKE
T. COUDERAY
Namekagon River
Spring Lake Creek
Loon Lake
Beaver Lake
Mud Lake
Colbroth Lake
Bean Lake
King Lake
Devils Lake
Bean Brook Springs
Spring Lake
Peter Lake
Adina Lake
Murray Lake
Williams Lake
Island Lake
Christner Lake
Graveyard Springs
Grindstone Creek
Lower Grindstone Spring
Grindstone Lake
Windigo Lake
Hub Lake
Lake Twenty-seven
Minnemac Lake
Schoolhouse Lake
Durphee Lake
Johnson Lake
Burno Lake
Tripp Lake
Ring Lake
Lac Courte Oreilles
Cranberry Bog
Whitefish Lake
Billy Boy Flowage
Sand Creek
Sand Lake
Little Sand Lake
Little Stone Lake
Stone Lake
Pearce Lake
Lower Holly Lake
Ham Lake
Hungry Lake
Snag Lake
Hauer Spring
Couderay River
Surette Creek
N BEAVER LAKE RD
RAINBOW RD
ROHLF RD
BOYS CAMP RD
ANDERSON RD
HIGHLINE RD
WILLIAMS RD
COLBROTH RD
OHIO RD
FROEMEL
HENKS RD
MCGRAW RD
STONE LAKE RD
MOYER RD
EDGEWOOD DR
RAYS RD
LAKESHORE RD
KELLNER RD
LAKE RD
METCALF RD
HIGHLAND RD
BOYLAN RD
WAKEFIELD RD
POTATO RD
FLEMING RD
WALTER RD
SAND LAKE RD
PANK RD
HAM LAKE LN
DEVILS LAKE RD
STRABEL RD
DAWN RD
COTEY RD
63
27
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E
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KK
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BB
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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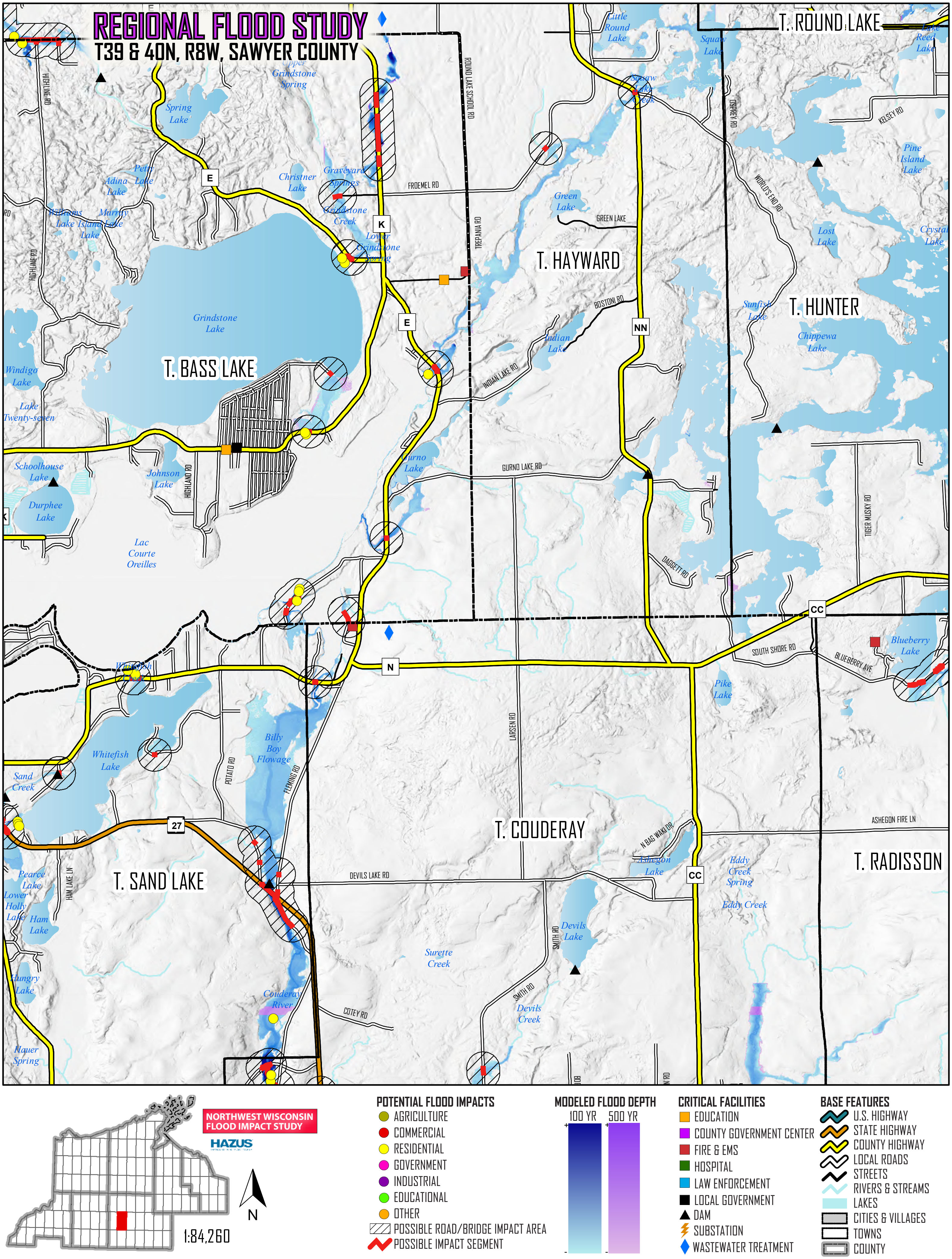
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R8W, SAWYER COUNTY
T. ROUND LAKE
T. HAYWARD
T. HUNTER
T. BASS LAKE
T. COUDERAY
T. SAND LAKE
T. RADISSON
Grindstone Lake
Lac Courte Oreilles
Whitefish Lake
Billy Boy Flowage
Chippewa Lake
Spring Lake
Windigo Lake
Lake Twenty-seven
Schoolhouse Lake
Durphee Lake
Johnson Lake
Gurno Lake
Green Lake
Indian Lake
Sunfish Lake
Lost Lake
Crystal Lake
Pine Island Lake
Squaw Lake
Little Round Lake
Reed Lake
Blueberry Lake
Pike Lake
Ashegon Lake
Devils Lake
Pearce Lake
Lower Holly Lake
Ham Lake
Hungry Lake
Sand Creek
Surette Creek
Devils Creek
Eddy Creek
Eddy Creek Spring
Couderay River
Hauer Spring
Grindstone Creek
Graveyard Springs
Christner Lake
Adina Lake
Petit Lake
Williams Lake
Murray Island Lake
Upper Grindstone Spring
Lower Grindstone Spring
FROEMEL RD
ROUND LAKE SCHOOL RD
TREPANIA RD
GREEN LAKE
BOSTONI RD
INDIAN LAKE RD
GURNO LAKE RD
DAGGETT RD
SOUTH SHORE RD
BLUEBERRY AVE
TIGER MUSKY RD
WORLD'S END RD
OSPREY RD
KELSEY RD
HIGHLINE RD
HIGHLAND RD
POTATO RD
FLEMING RD
LARSEN RD
DEVILS LAKE RD
N BAG WAN DR
ASHEGON FIRE LN
HAM LAKE LN
SMITH RD
COTEY RD
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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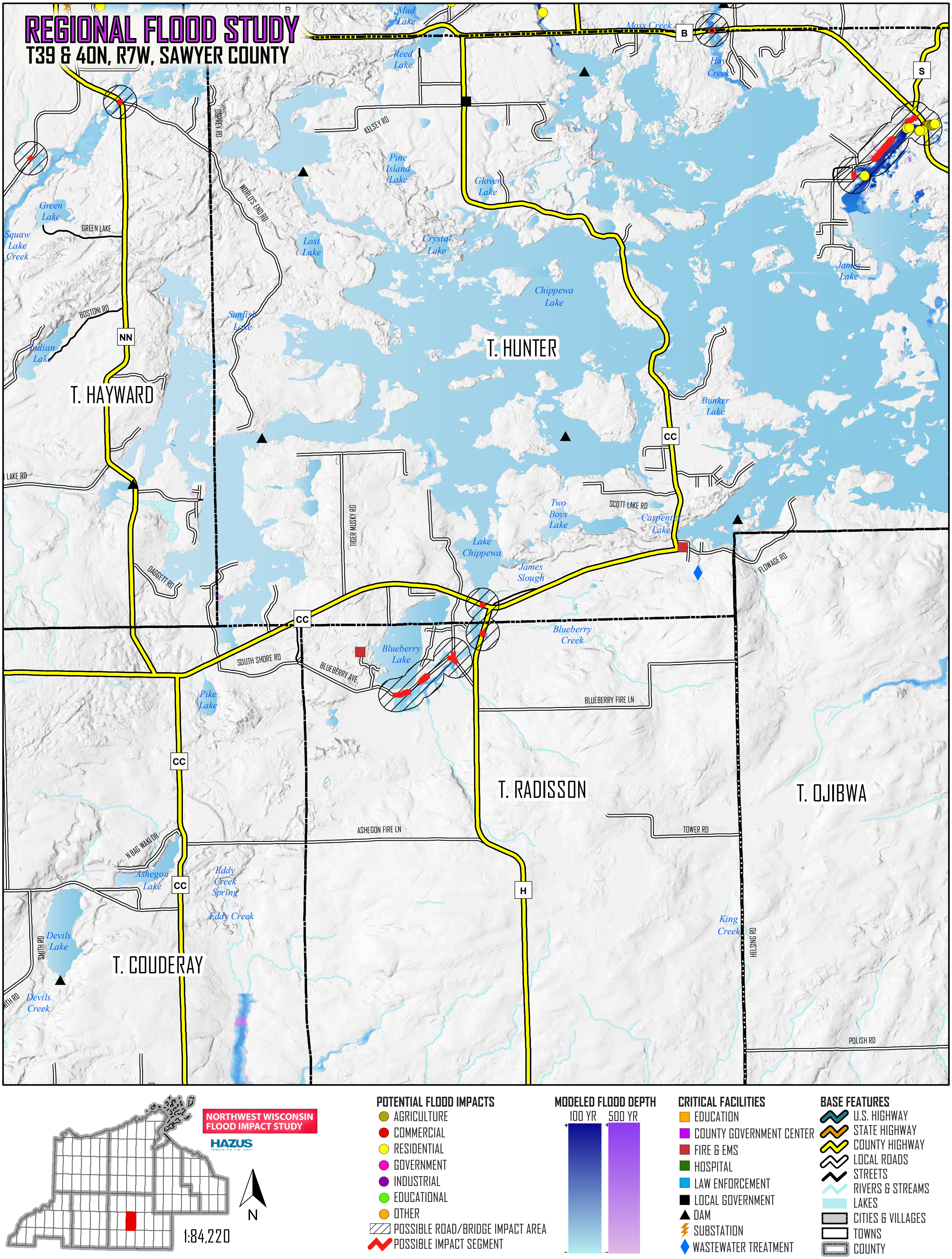
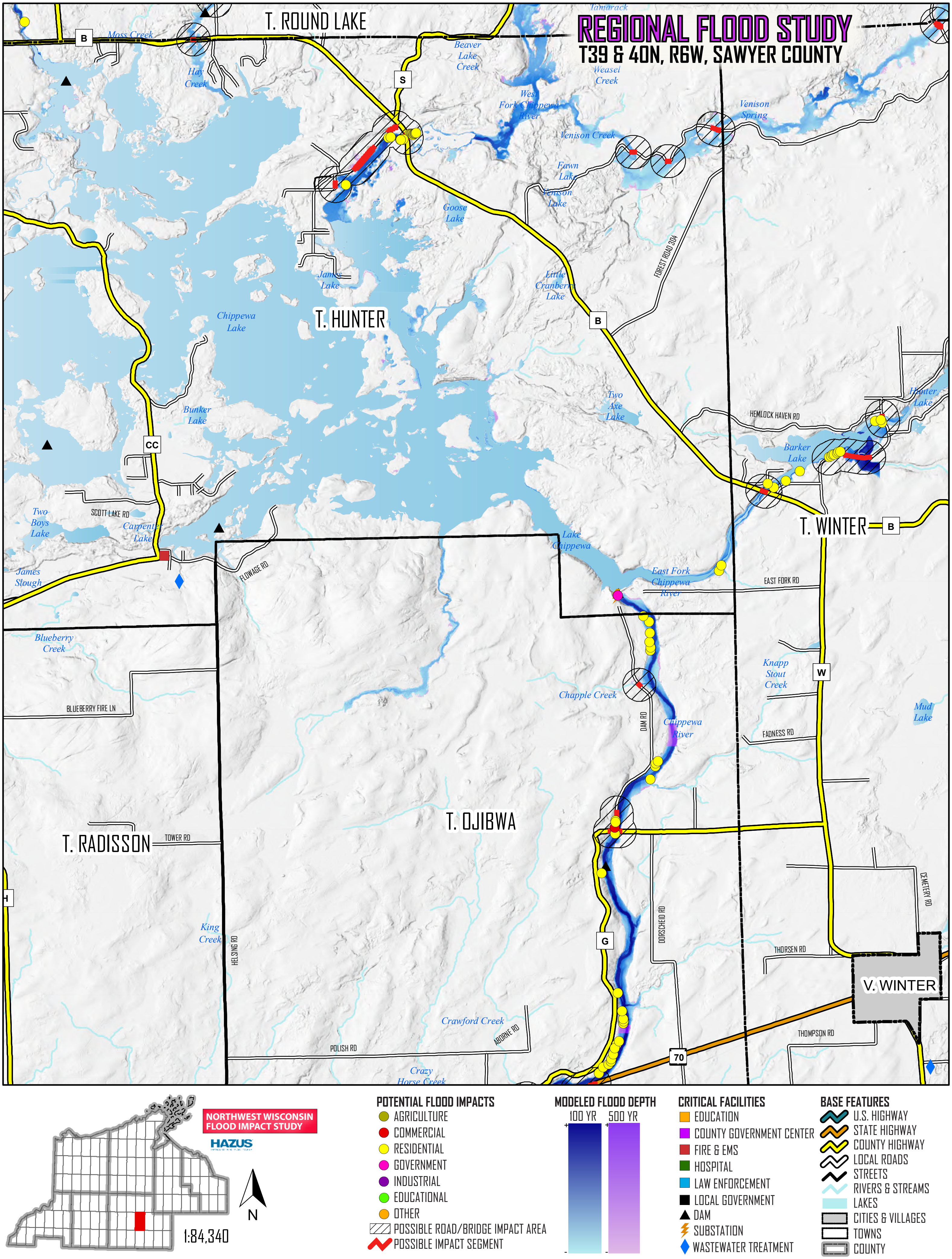
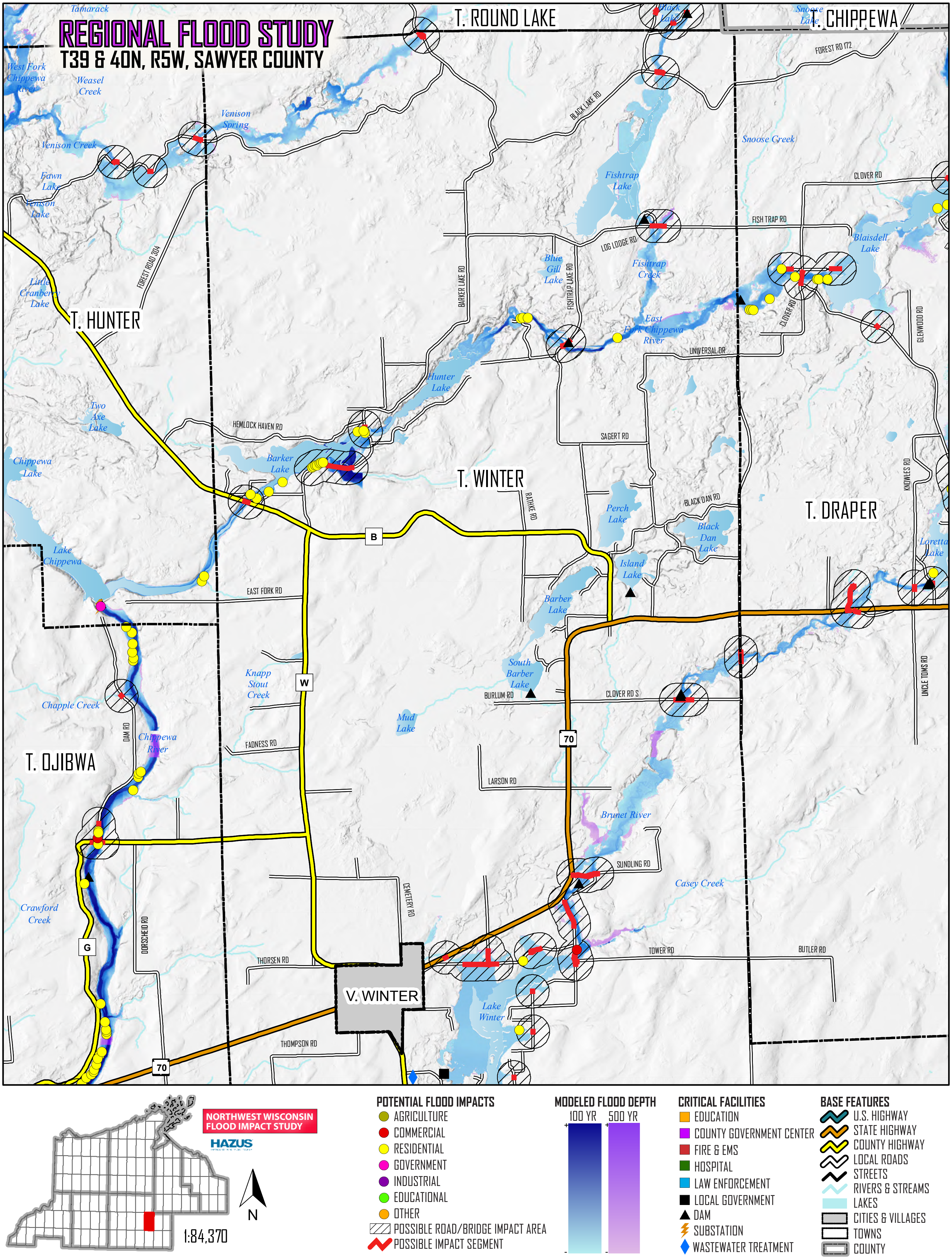
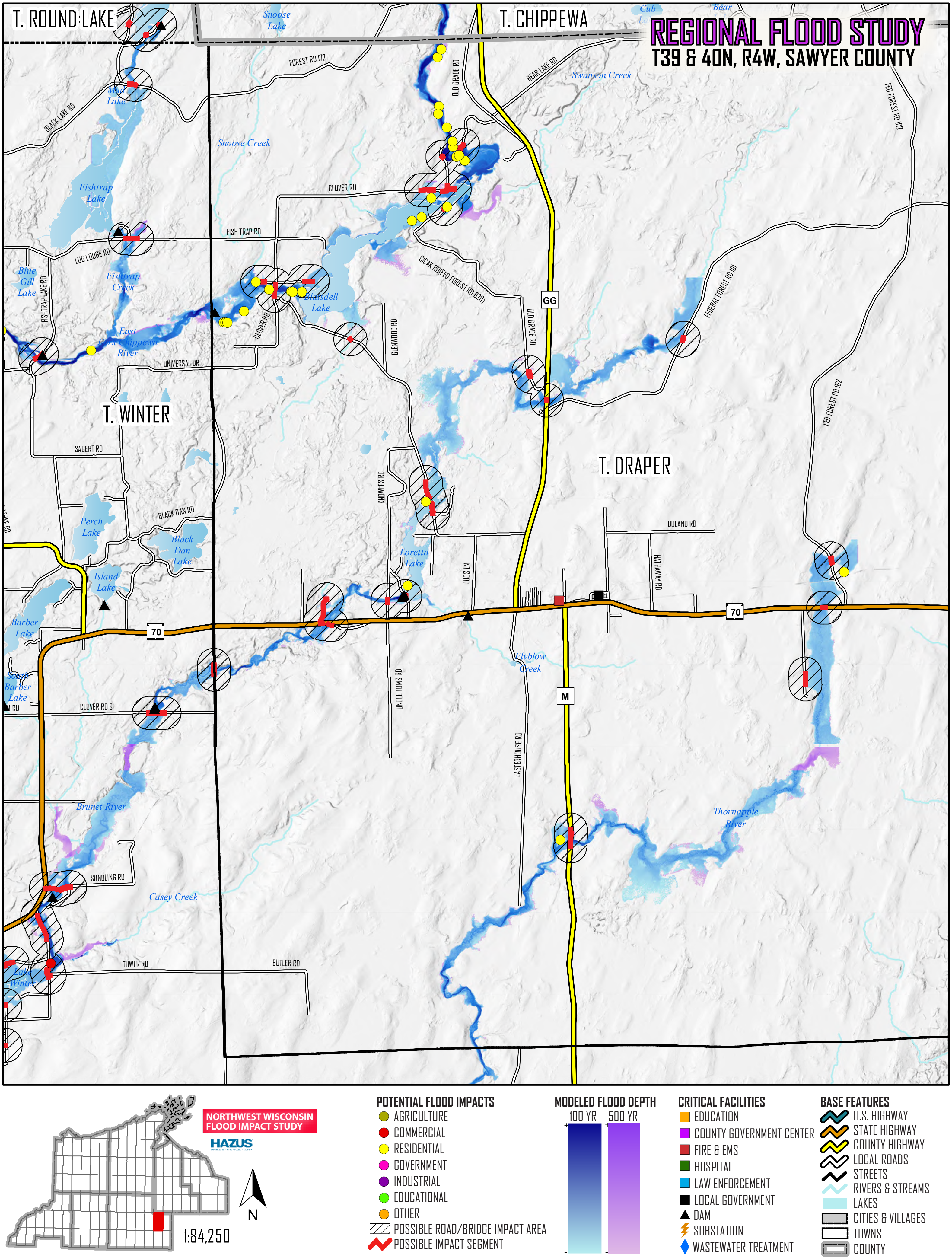
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R7W, SAWYER COUNTY
T. HAYWARD
T. HUNTER
T. RADISSON
T. OJIBWA
T. COUDERAY
Mud Lake
Reed Lake
Moss Creek
Hay Creek
Pine Island Lake
Glover Lake
Green Lake
GREEN LAKE
Squaw Lake Creek
Lost Lake
Crystal Lake
Chippewa Lake
James Lake
Sunfish Lake
Indian Lake
Bunker Lake
Two Boys Lake
SCOTT LAKE RD
Carpenter Lake
Lake Chippewa
James Slough
Blueberry Creek
Blueberry Lake
Pike Lake
SOUTH SHORE RD
BLUEBERRY AVE
BLUEBERRY FIRE LN
TIGER MUSKY RD
DAGGETT RD
BOSTON RD
WORLD'S END RD
OSPREY RD
KELSEY RD
LAKE RD
FLOWAGE RD
ASHEGON FIRE LN
TOWER RD
N BAG WAN DR
Ashegon Lake
Eddy Creek Spring
Eddy Creek
King Creek
HELSING RD
POLISH RD
Devils Lake
SMITH RD
Devils Creek
B
S
NN
CC
H
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:84,220


REGIONAL FLOOD STUDY
T39 & 40N, R6W, SAWYER COUNTY
T. ROUND LAKE
T. HUNTER
T. WINTER
T. OJIBWA
T. RADISSON
V. WINTER
Tamarack
Moss Creek
Hay Creek
Beaver Lake Creek
Weasel Creek
West Fork Chippewa River
Venison Spring
Venison Creek
Fawn Lake
Venison Lake
Goose Lake
James Lake
Little Cranberry Lake
FOREST ROAD 304
Chippewa Lake
Bunker Lake
Two Axe Lake
Hunter Lake
HEMLOCK HAVEN RD
Barker Lake
SCOTT LAKE RD
Two Boys Lake
Carpenter Lake
James Slough
Lake Chippewa
FLOWAGE RD
East Fork Chippewa River
EAST FORK RD
Blueberry Creek
BLUEBERRY FIRE LN
Knapp Stout Creek
Chapple Creek
DAM RD
Chippewa River
FADNESS RD
Mud Lake
TOWER RD
CEMETERY RD
King Creek
HELSING RD
DORSCHEID RD
THORSEN RD
Crawford Creek
ABORNE RD
POLISH RD
THOMPSON RD
Crazy Horse Creek
B
S
CC
W
G
H
70
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:84,340
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R5W, SAWYER COUNTY
T. ROUND LAKE
T. CHIPPEWA
T. HUNTER
T. WINTER
T. DRAPER
T. OJIBWA
V. WINTER
Tamarack
West Fork Chippewa River
Weasel Creek
Venison Spring
Venison Creek
Fawn Lake
Venison Lake
Little Cranberry Lake
Two Axe Lake
Chippewa Lake
Lake Chippewa
Chapple Creek
Chippewa River
Crawford Creek
Barker Lake
Hunter Lake
Blue Gill Lake
Fishtrap Lake
Fishtrap Creek
East Fork Chippewa River
Black Lake
Snoose Lake
Snoose Creek
Blaisdell Lake
Perch Lake
Black Dan Lake
Island Lake
Barber Lake
South Barber Lake
Loretta Lake
Knapp Stout Creek
Mud Lake
Brunet River
Casey Creek
Lake Winter
FOREST RD 172
BLACK LAKE RD
CLOVER RD
FISH TRAP RD
LOG LODGE RD
FISHTRAP LAKE RD
BARKER LAKE RD
FOREST ROAD 304
CLOVER RD
GLENWOOD RD
UNIVERSAL DR
HEMLOCK HAVEN RD
SAGERT RD
RATHKE RD
BLACK DAN RD
KNOWLES RD
EAST FORK RD
BURLUM RD
CLOVER RD S
UNCLE TOMS RD
DAM RD
FADNESS RD
LARSON RD
SUNDLING RD
CEMETERY RD
DORSCHEID RD
THORSEN RD
TOWER RD
BUTLER RD
THOMPSON RD
B
W
G
70
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:84,370
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R4W, SAWYER COUNTY
T. ROUND LAKE
T. CHIPPEWA
T. WINTER
T. DRAPER
Snoose Lake
Snoose Creek
Swanson Creek
Cub
Bear
Mud Lake
Fishtrap Lake
Fishtrap Creek
Blue Gill Lake
East Fork Chippewa River
Blaisdell Lake
Perch Lake
Black Dan Lake
Island Lake
Barber Lake
South Barber Lake
Loretta Lake
Flyblow Creek
Brunet River
Casey Creek
Thornapple River
Lake Winter
FOREST RD 172
BLACK LAKE RD
OLD GRADE RD
BEAR LAKE RD
FED FOREST RD 162
CLOVER RD
FISH TRAP RD
LOG LODGE RD
FISHTRAP LAKE RD
CICAK RD(FED FOREST RD 620)
GLENWOOD RD
FEDERAL FOREST RD 161
UNIVERSAL DR
SAGERT RD
BLACK DAN RD
KNOWLES RD
DOLAND RD
HATHAWAY RD
LUDS LN
UNCLE TOMS RD
EASTERHOUSE RD
CLOVER RD S
SUNDLING RD
TOWER RD
BUTLER RD
GG
70
M
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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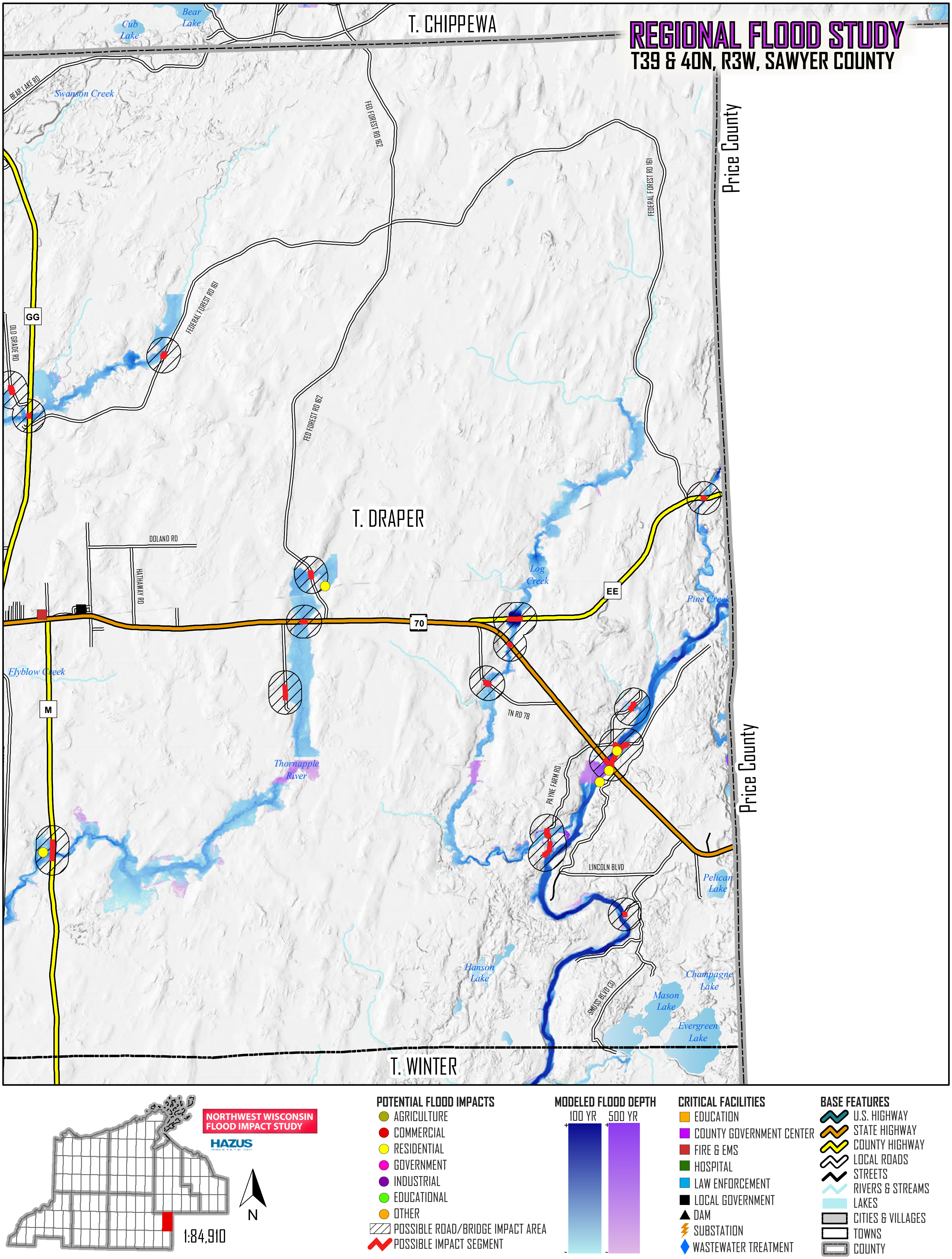
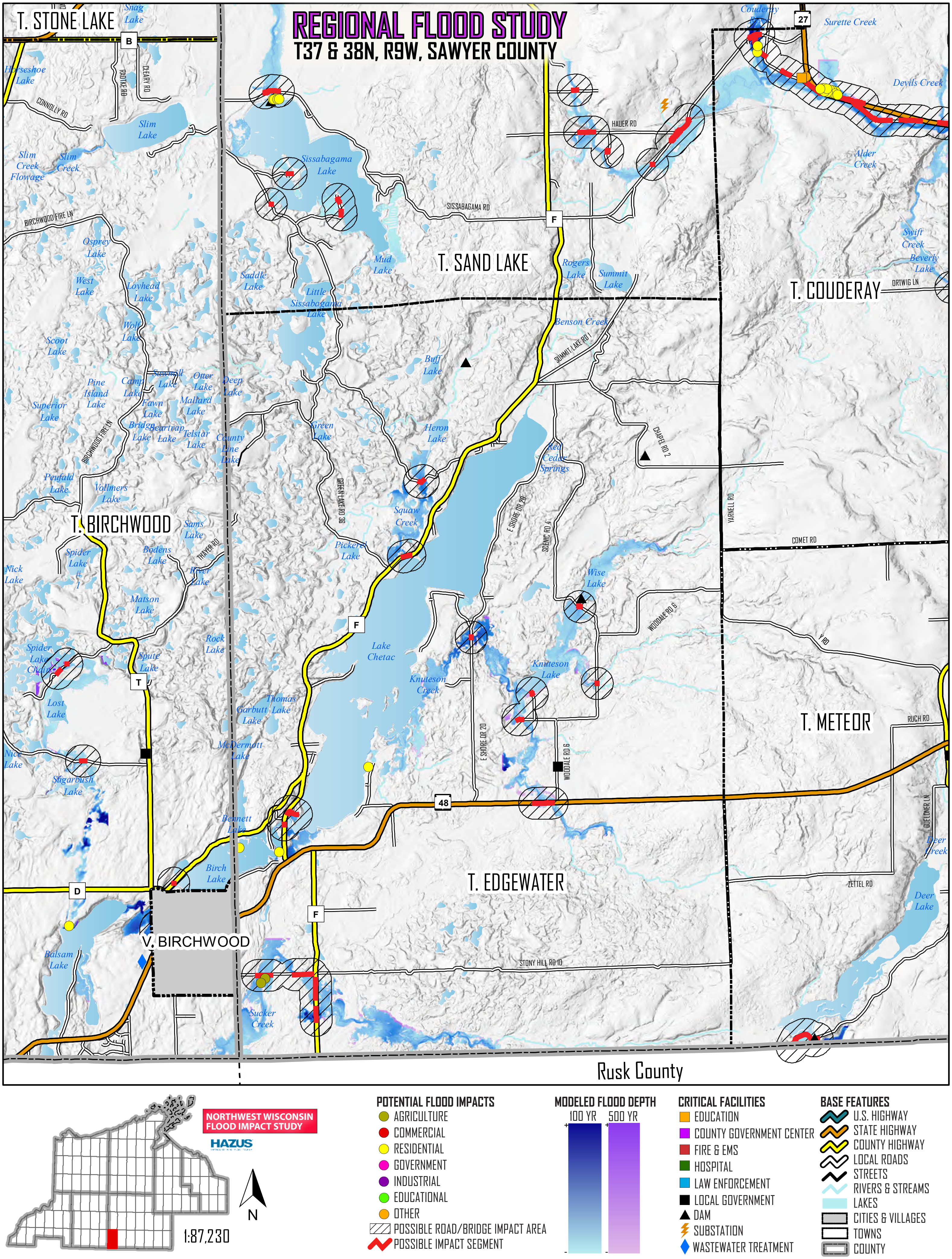
1:84,250


REGIONAL FLOOD STUDY
T39 & 40N, R3W, SAWYER COUNTY
T. CHIPPEWA
T. DRAPER
T. WINTER
Price County
Price County
Cub Lake
Bear Lake
Swanson Creek
BEAR LAKE RD
FED FOREST RD 162
FEDERAL FOREST RD 161
FEDERAL FOREST RD 161
FED FOREST RD 162
OLD GRADE RD
GG
DOLAND RD
HATHAWAY RD
Log Creek
EE
Pine Creek
70
Flyblow Creek
M
TN RD 78
Thornapple River
PAYNE FARM RD
LINCOLN BLVD
Pelican Lake
Hanson Lake
Champagne Lake
Mason Lake
Evergreen Lake
SMASS BLVD (S)
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:84,910
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R9W, SAWYER COUNTY
T. STONE LAKE
T. SAND LAKE
T. COUDERAY
T. BIRCHWOOD
T. METEOR
T. EDGEWATER
V. BIRCHWOOD
Rusk County
Snag Lake
Horseshoe Lake
Slim Lake
Slim Creek Flowage
Slim Creek
Sissabagama Lake
Mud Lake
Saddle Lake
Little Sissabagama Lake
Rogers Lake
Summit Lake
Benson Creek
Couderay River
Surette Creek
Devils Creek
Alder Creek
Swift Creek
Beverly Lake
Osprey Lake
West Lake
Loyhead Lake
Wolf Lake
Scoot Lake
Pine Island Lake
Camp Lake
Sawmill Lake
Otter Lake
Deep Lake
Superior Lake
Fawn Lake
Mallard Lake
Bridge Lake
Beartrap Lake
Telstar Lake
County Line Lake
Green Lake
Heron Lake
Buff Lake
Red Cedar Springs
Peufald Lake
Vollmers Lake
Squaw Creek
Pickerel Lake
Sams Lake
Spider Lake
Bodens Lake
Nick Lake
River Lake
Matson Lake
Wise Lake
Lake Chetac
Rock Lake
Spider Lake Chain
Spute Lake
Knuteson Lake
Knuteson Creek
Thomas Lake
Garbutt Lake
Lost Lake
Nice Lake
McDermott Lake
Sugarbush Lake
Bennett Lake
Birch Lake
Balsam Lake
Sucker Creek
Deer Creek
Deer Lake
CONNOLLY RD
RADTKE RD
CLEARY RD
BIRCHWOOD FIRE LN
HAUER RD
SISSABAGAMA RD
SUMMIT LAKE RD 1
CHAPEL RD 2
ORTWIG LN
YARNELL RD
COMET RD
GREEN LAKE RD 3B
E SHORE DR 2B
SCENIC RD 4
THAYER RD
WOODALE RD 6
Y RD
RUCH RD
E SHORE DR 2D
WOODALE RD 6
GUELDNER LN
ZETTEL RD
STONY HILL RD 10
B
27
F
T
48
D
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:87,230
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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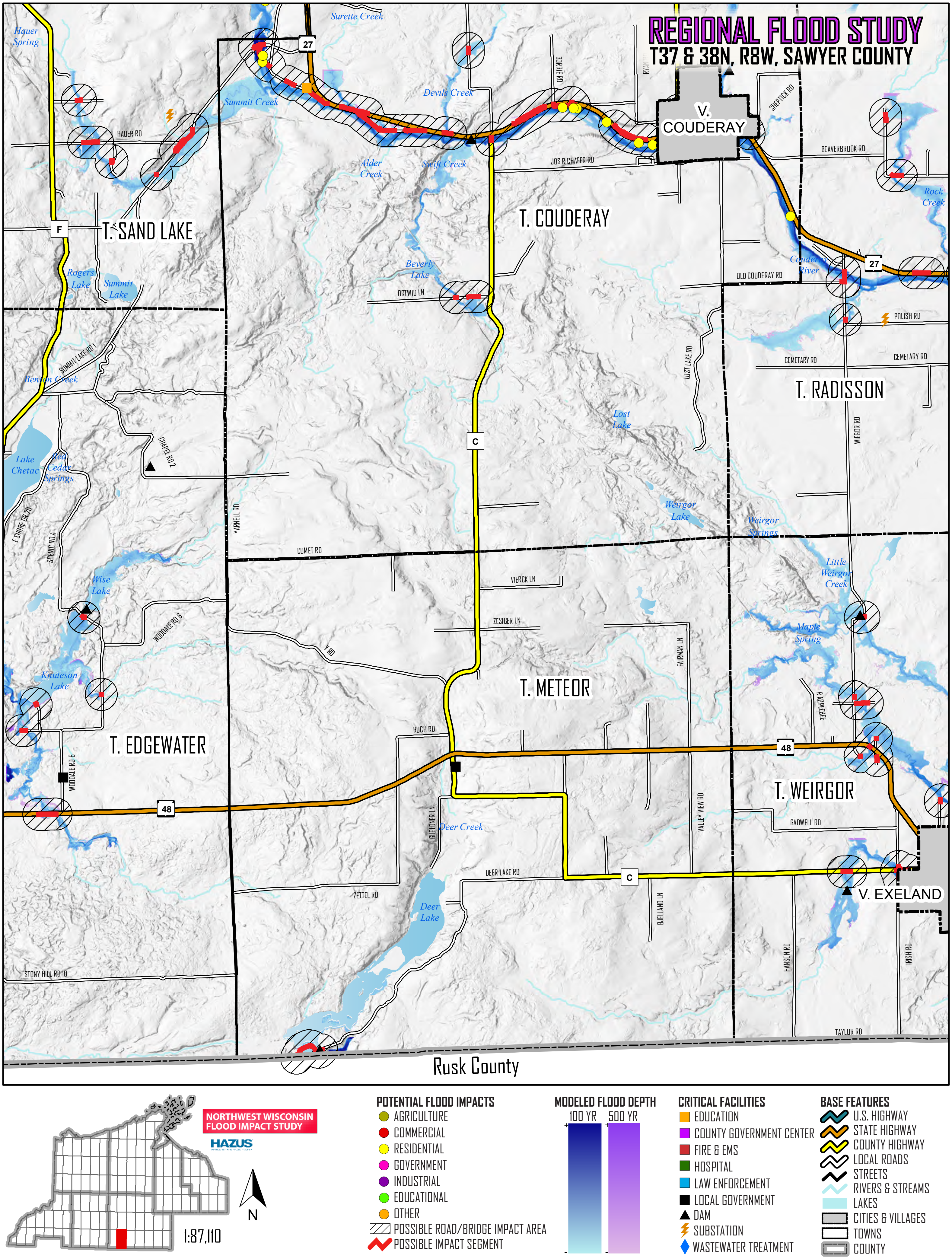
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
T37 & 38N, R8W, SAWYER COUNTY
V. COUDERAY
T. SAND LAKE
T. COUDERAY
T. RADISSON
T. EDGEWATER
T. METEOR
T. WEIGROR
V. EXELAND
Rusk County
Hauer Spring
Surette Creek
Summit Creek
Devils Creek
Alder Creek
Swift Creek
Rock Creek
Couderay River
Rogers Lake
Summit Lake
Beverly Lake
Benson Creek
Lost Lake
Lake Chetac
Red Cedar Springs
Weirgor Lake
Weirgor Springs
Little Weirgor Creek
Wise Lake
Maple Spring
Knuteson Lake
Deer Creek
Deer Lake
HAUER RD
BORRIE RD
JOS R CHAFER RD
BEAVERBROOK RD
SHEPTICK RD
OLD COUDERAY RD
ORTWIG LN
POLISH RD
CEMETARY RD
SUMMIT LAKE RD 1
LOST LAKE RD
WIEGOR RD
CHAPEL RD 2
YARNELL RD
E SHORE DR 20
SCENIC RD 4
COMET RD
VIERCK LN
ZESIGER LN
WOODALE RD 6
Y RD
FAIRMAN LN
R APPLEBEE
RUCH RD
WOODALE RD 6
GJEFLONER LN
VALLEY VIEW RD
GADWELL RD
DEER LAKE RD
ZETTEL RD
BJELLAND LN
HANSON RD
IRISH RD
STONY HILL RD 10
TAYLOR RD
27
F
C
48
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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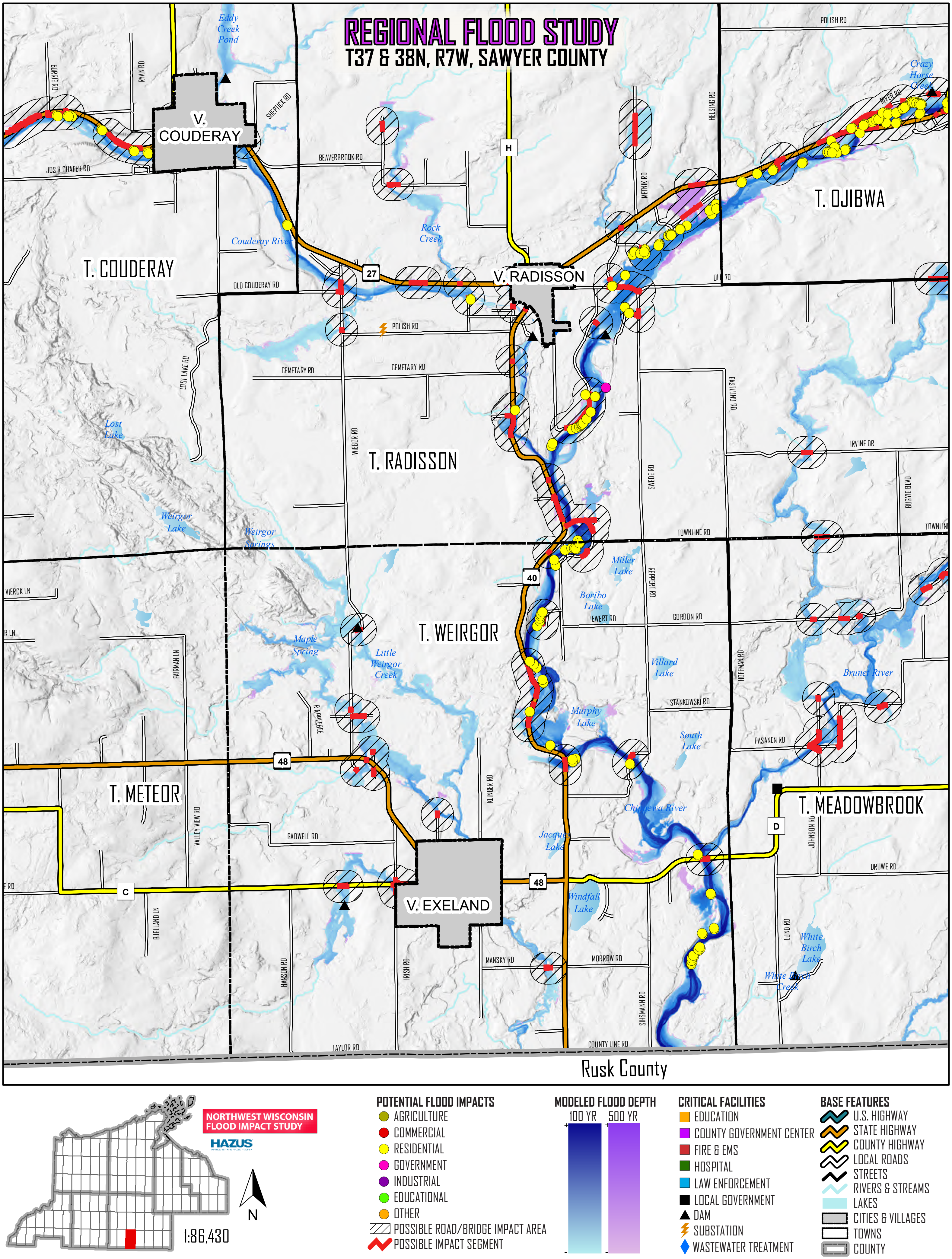
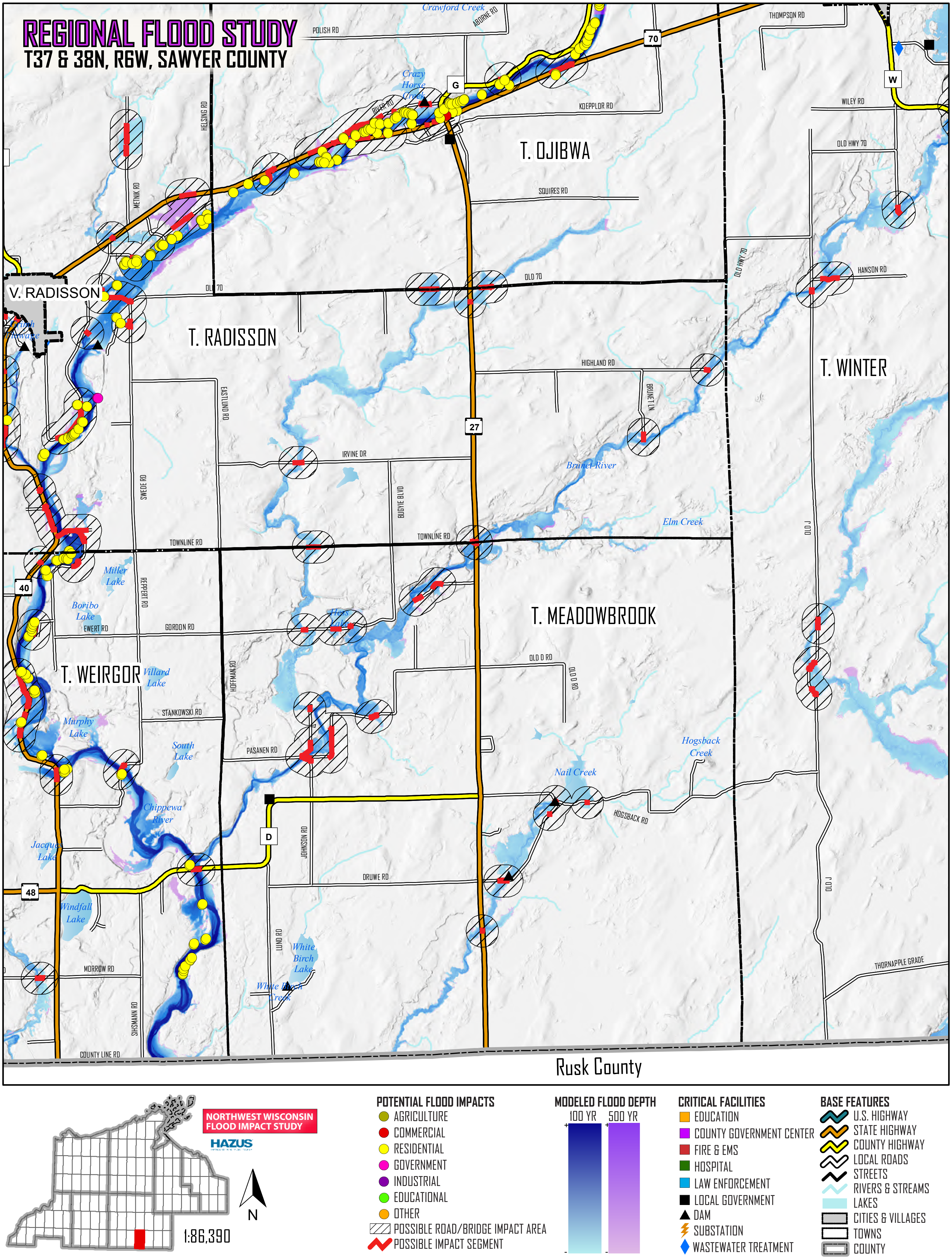
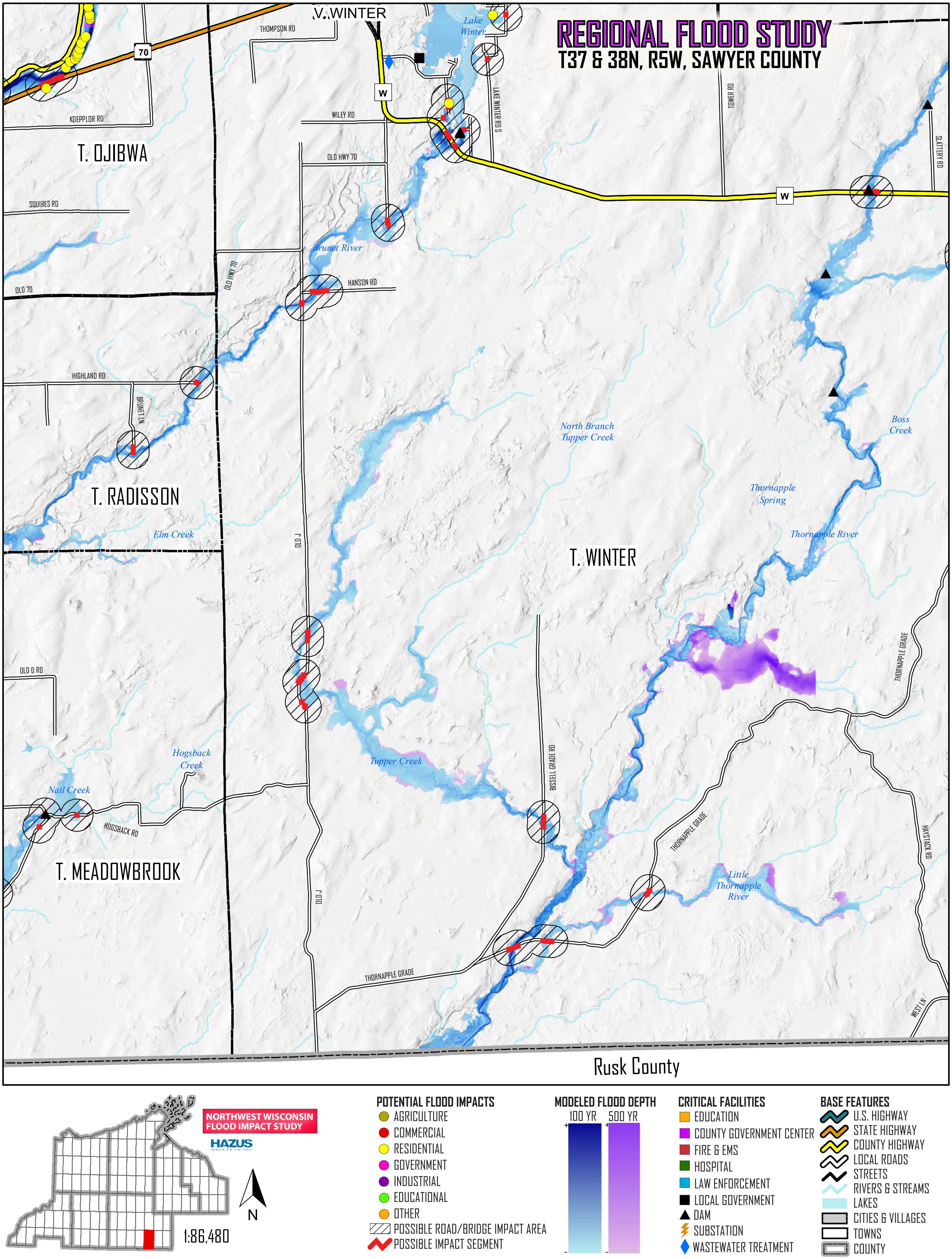

REGIONAL FLOOD STUDY
T37 & 38N, R7W, SAWYER COUNTY
Eddy Creek Pond
BORRIE RD
RYAN RD
V. COUDERAY
SHEPTICK RD
BEAVERBROOK RD
JOS R CHAFER RD
H
POLISH RD
HELSING RD
Crazy Horse Creek
RIVER RD
METNIK RD
T. OJIBWA
Rock Creek
Couderay River
T. COUDERAY
27
OLD COUDERAY RD
V. RADISSON
OLD 70
POLISH RD
CEMETARY RD
CEMETARY RD
LOST LAKE RD
EASTLUND RD
Lost Lake
WEGOR RD
T. RADISSON
IRVINE DR
SWEDE RD
BUGYIE BLVD
Weirgor Lake
Weirgor Springs
TOWNLINE RD
TOWNLINE
Miller Lake
VIERCK LN
40
REPPERT RD
Boribo Lake
EWERT RD
GORDON RD
Maple Spring
T. WEIRGOR
Little Weirgor Creek
FAIRMAN LN
Villard Lake
HOFFMAN RD
Brunet River
STANKOWSKI RD
R APPLEBEE
Murphy Lake
South Lake
PASANEN RD
48
T. METEOR
KLINGER RD
Chippewa River
T. MEADOWBROOK
VALLEY VIEW RD
D
JOHNSON RD
GADWELL RD
Jacques Lake
DRUWE RD
C
48
V. EXELAND
Windfall Lake
BJELLAND LN
LUND RD
White Birch Lake
HANSON RD
IRISH RD
MANSKY RD
MORROW RD
White Birch Creek
SIHSMANN RD
TAYLOR RD
COUNTY LINE RD
Rusk County
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,430
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
+
+
-
-
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R6W, SAWYER COUNTY
T. OJIBWA
T. RADISSON
T. WINTER
T. MEADOWBROOK
T. WEIRGOR
V. RADISSON
Rusk County
Crawford Creek
Crazy Horse Creek
Brunet River
Elm Creek
Hogsback Creek
Nail Creek
Chippewa River
White Birch Creek
Miller Lake
Boribo Lake
Villard Lake
Murphy Lake
South Lake
Jacques Lake
Windfall Lake
White Birch Lake
Hess Lake
POLISH RD
ABORNE RD
THOMPSON RD
RIVER RD
KOEPPLOR RD
HELSING RD
METNIK RD
SQUIRES RD
WILEY RD
OLD HWY 70
OLD 70
HANSON RD
HIGHLAND RD
BRUNET LN
EASTLUND RD
IRVINE DR
SWEDE RD
BUGYIE BLVD
TOWNLINE RD
REPPERT RD
EWERT RD
GORDON RD
OLD D RD
HOFFMAN RD
STANKOWSKI RD
PASANEN RD
HOGSBACK RD
JOHNSON RD
DRUWE RD
LUND RD
MORROW RD
SISHMANN RD
COUNTY LINE RD
THORNAPPLE GRADE
OLD J
70
G
W
27
40
D
48
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,390
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R5W, SAWYER COUNTY
V. WINTER
Lake Winter
THOMPSON RD
70
W
KOEPPLOR RD
WILEY RD
OLD HWY 70
LAKE WINTER RD S
TOWER RD
SLATTERY RD
T. OJIBWA
SQUIRES RD
Brunet River
OLD 70
OLD HWY 70
HANSON RD
HIGHLAND RD
BRUNET LN
T. RADISSON
Elm Creek
OLD J
North Branch Tupper Creek
Boss Creek
Thornapple Spring
Thornapple River
T. WINTER
OLD D RD
THORNAPPLE GRADE
Hogsback Creek
Nail Creek
Tupper Creek
BISSELL GRADE RD
HOGSBACK RD
T. MEADOWBROOK
HAYSTACK RD
Little Thornapple River
WEST LN
Rusk County
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,480
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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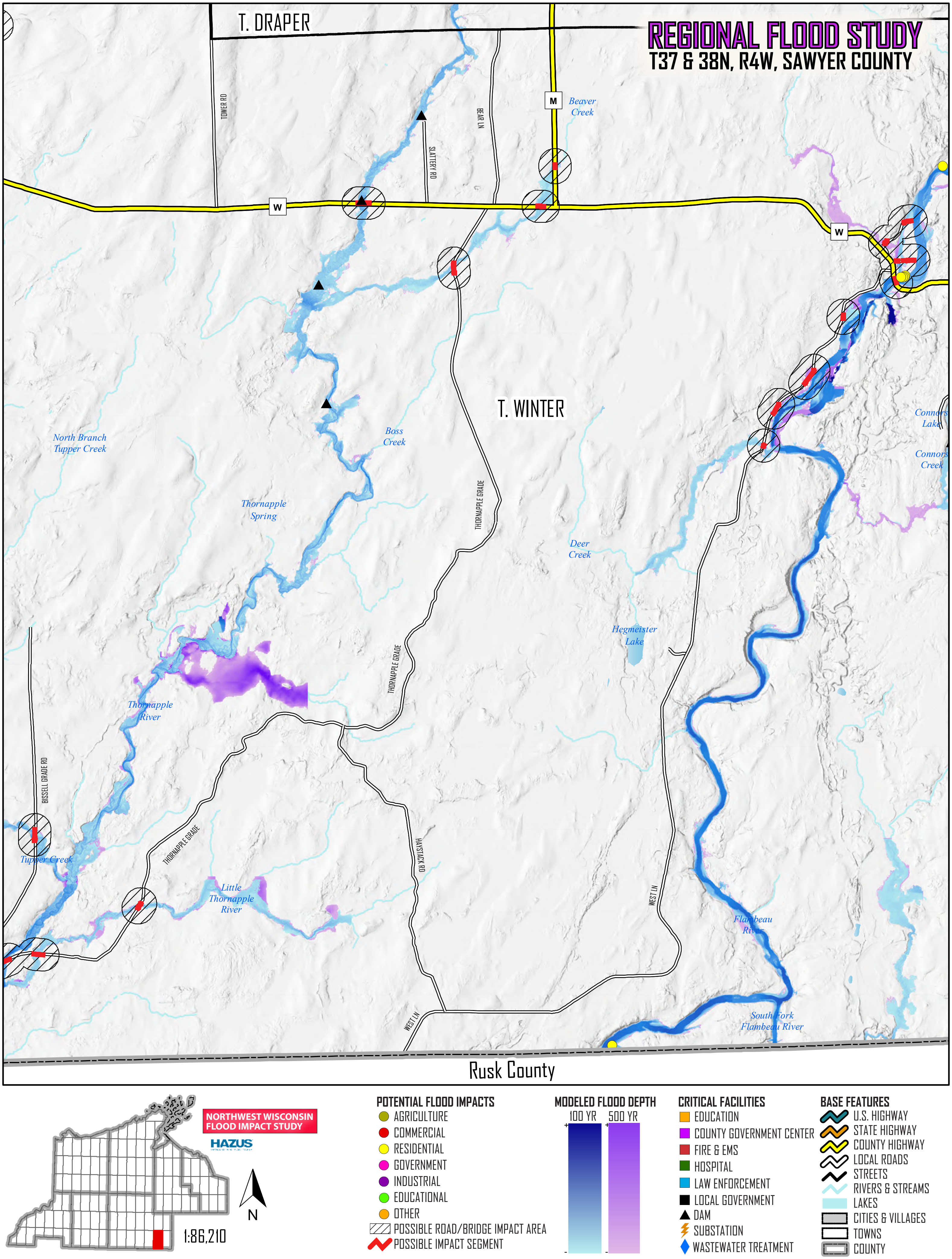
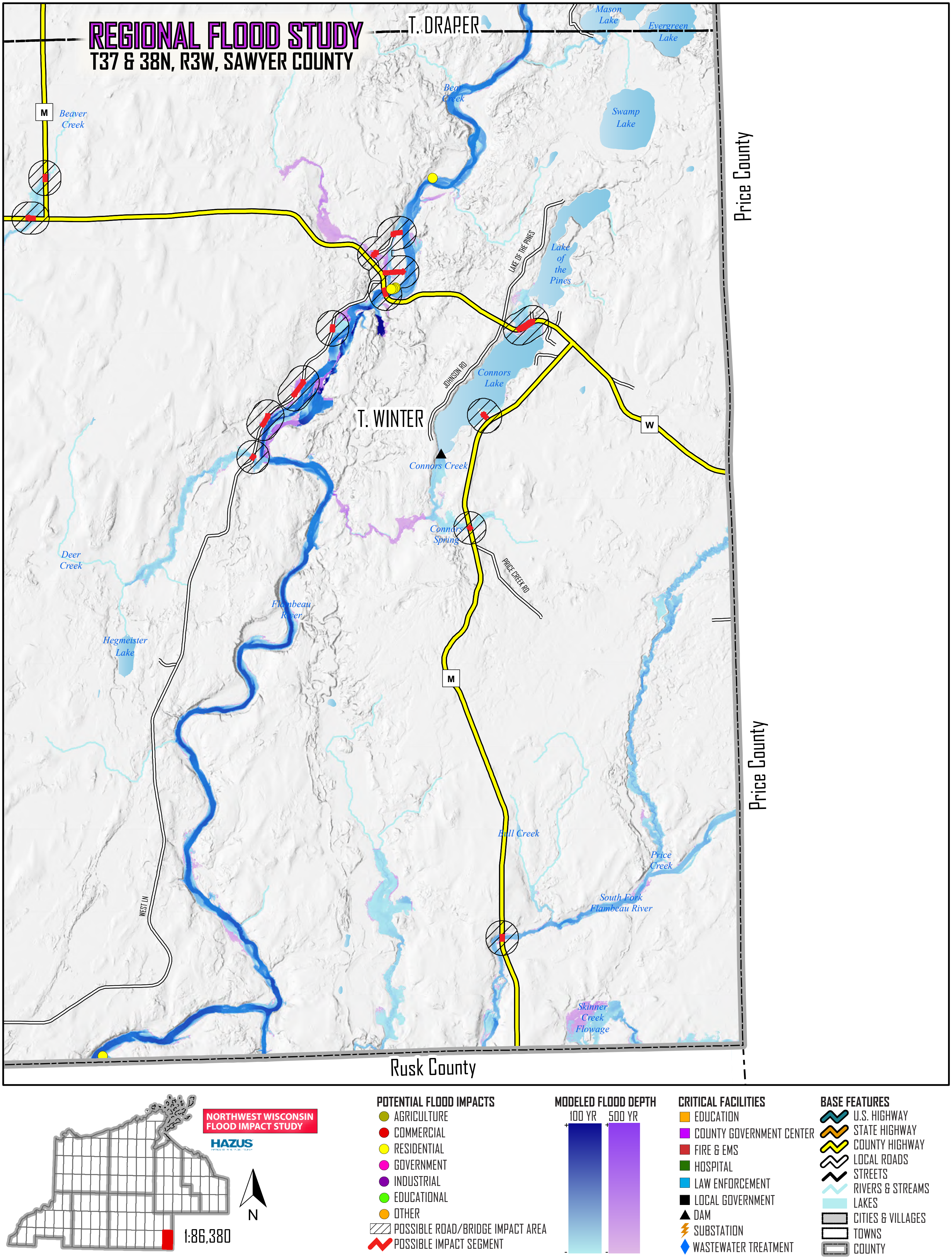
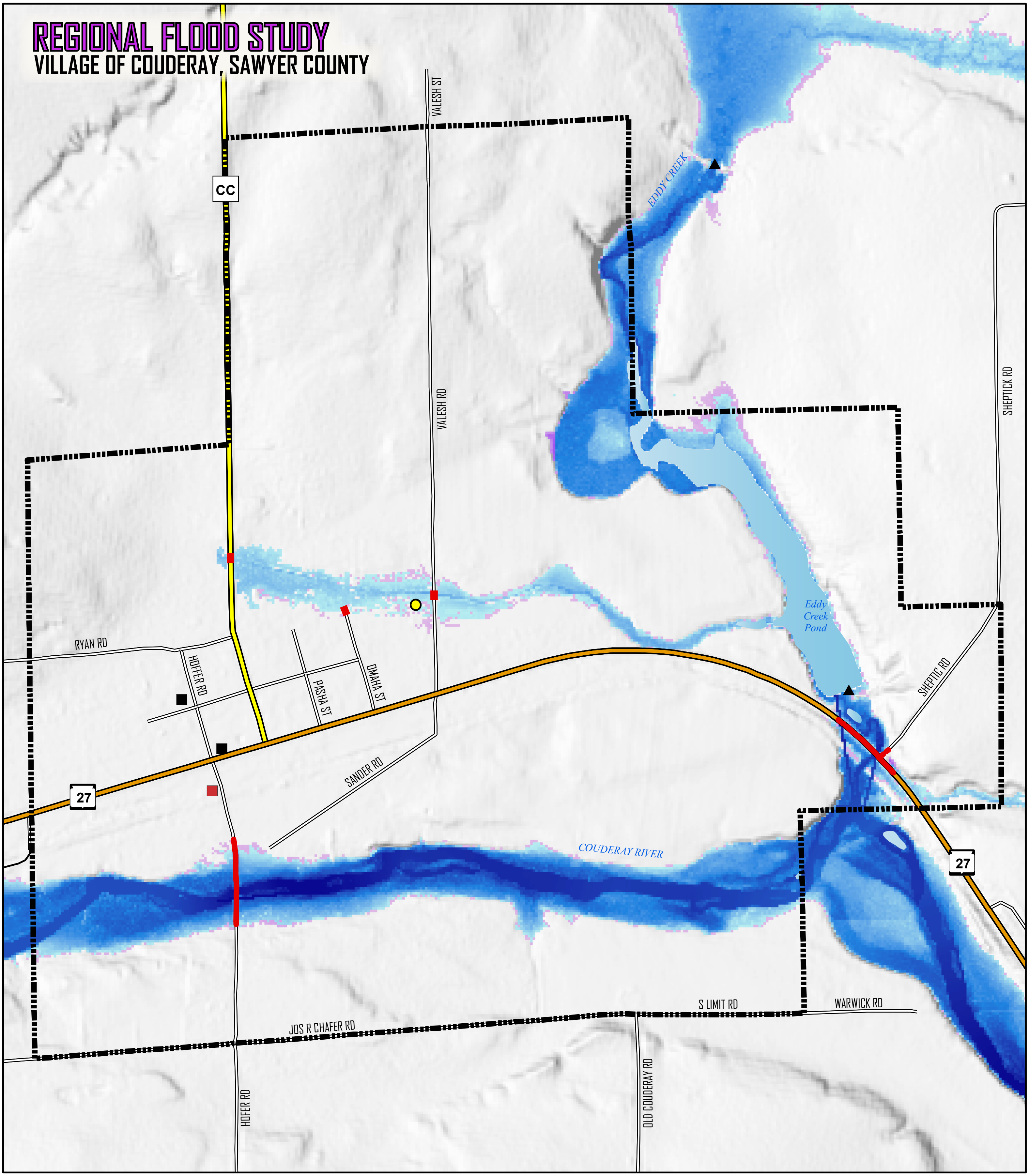
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R4W, SAWYER COUNTY
T. DRAPER
T. WINTER
Rusk County
TOWER RD
BEAR LN
SLATTERY RD
M
W
Beaver Creek
North Branch Tupper Creek
Boss Creek
Thornapple Spring
THORNAPPLE GRADE
Deer Creek
Hegmeister Lake
Connors Lake
Connors Creek
Thornapple River
BISSELL GRADE RD
Tupper Creek
Little Thornapple River
HAYSTACK RD
WEST LN
Flambeau River
South Fork Flambeau River
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,210
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R3W, SAWYER COUNTY
T. DRAPER
Mason Lake
Evergreen Lake
Swamp Lake
Beaver Creek
Bear Creek
Lake of the Pines
LAKE OF THE PINES
Connors Lake
JOHNSON RD
T. WINTER
Connors Creek
Connors Spring
PRICE CREEK RD
Deer Creek
Flambeau River
Hegmeister Lake
WEST LN
Bull Creek
Price Creek
South Fork Flambeau River
Skinner Creek Flowage
Price County
Price County
Rusk County
M
M
W
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:86,380
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



NORTHWEST WISCONSIN FLOOD IMPACT STUDY

HAZUS

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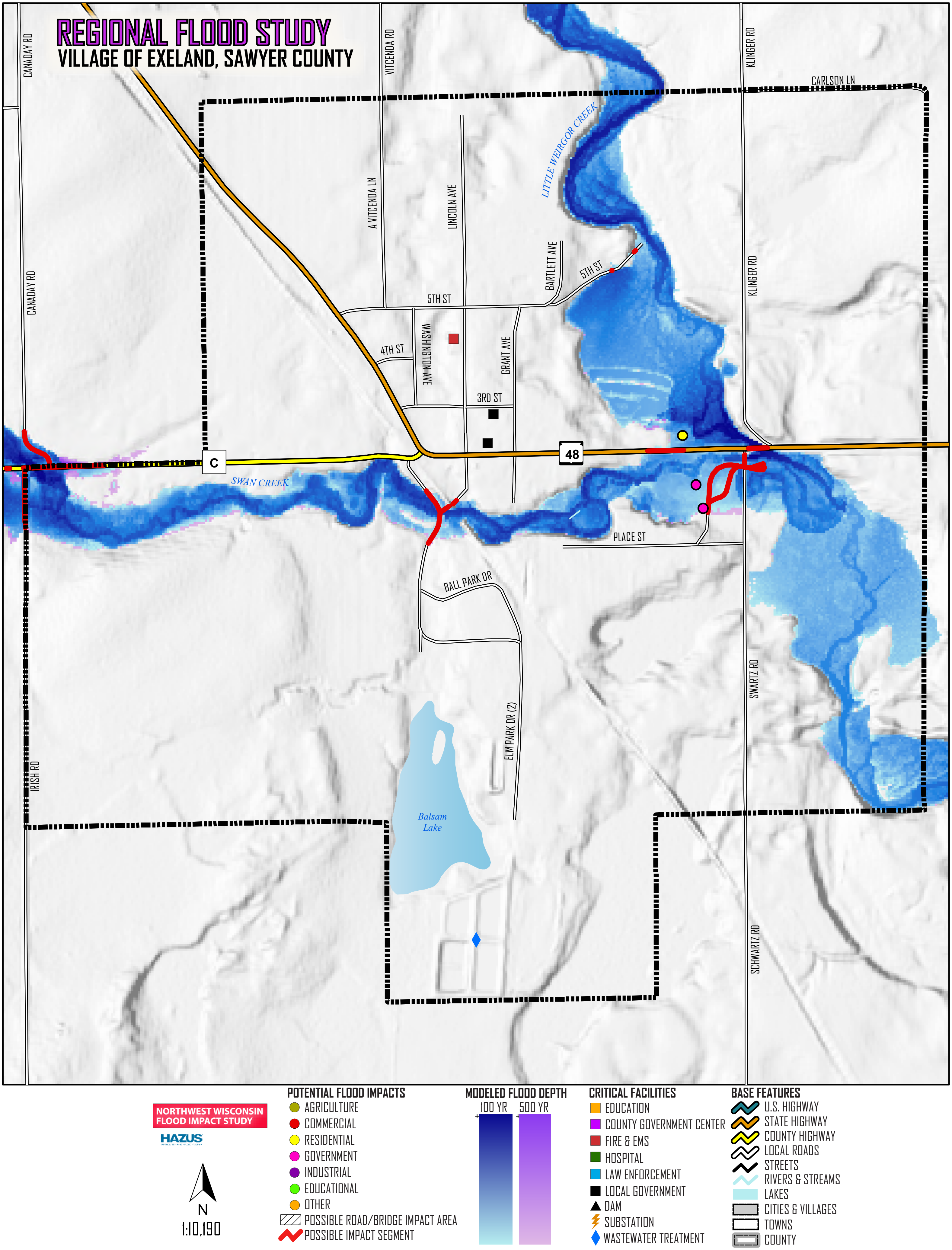
POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

MODELED FLOOD DEPTH

100 YR | 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



REGIONAL FLOOD STUDY
VILLAGE OF EXELAND, SAWYER COUNTY
CANADAY RD
VITCENDA RD
KLINGER RD
CARLSON LN
LITTLE WEIRGOR CREEK
A VITCENDA LN
LINCOLN AVE
BARTLETT AVE
5TH ST
4TH ST
WASHINGTON AVE
GRANT AVE
3RD ST
C
48
SWAN CREEK
PLACE ST
BALL PARK DR
ELM PARK DR (2)
IRISH RD
SWARTZ RD
SCHWARTZ RD
Balsam Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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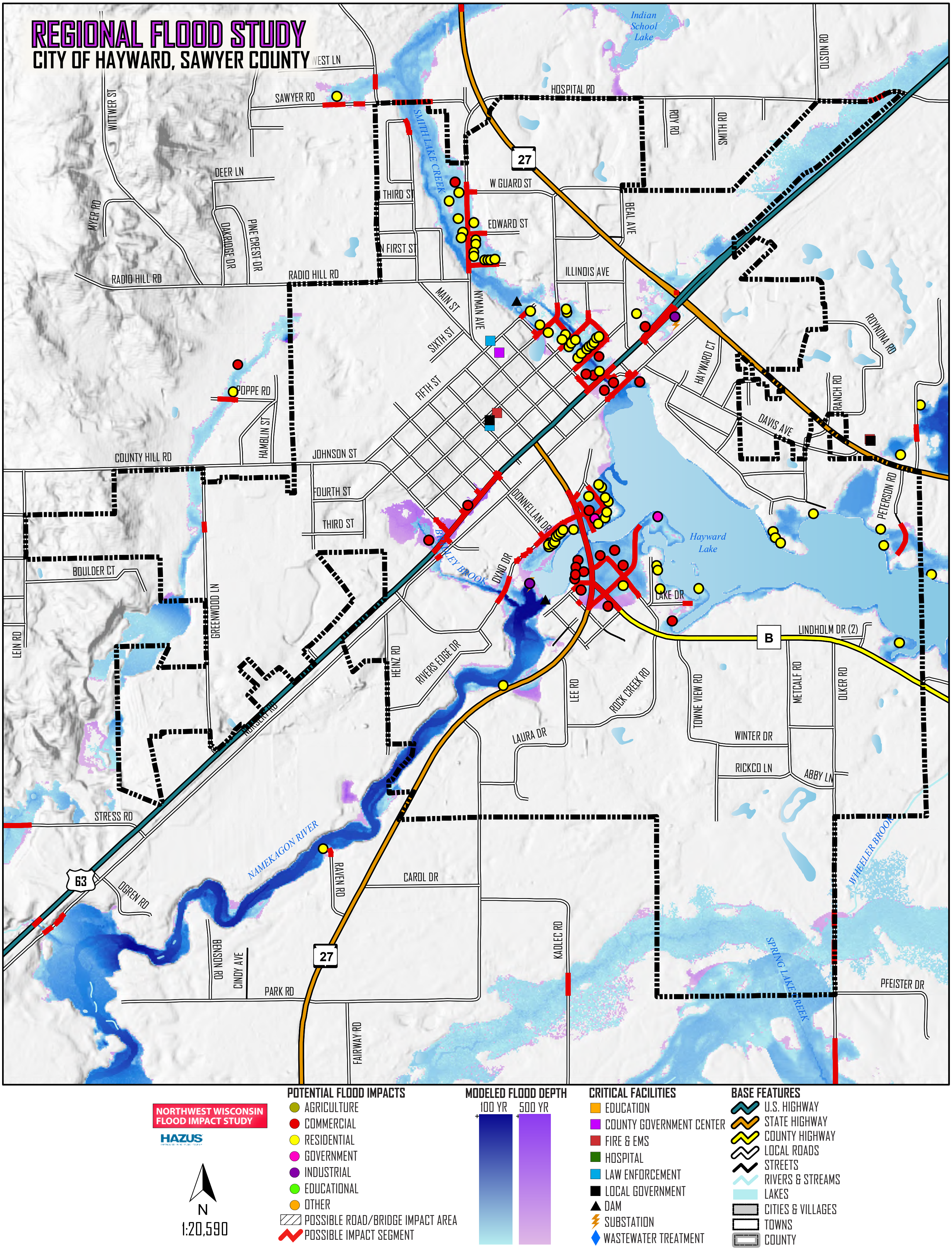
1:10,190
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
CITY OF HAYWARD, SAWYER COUNTY
WEST LN
SAWYER RD
HOSPITAL RD
Indian School Lake
OLSON RD
WITTWER ST
SMITH LAKE CREEK
27
ROY RD
SMITH RD
DEER LN
THIRD ST
W GUARD ST
BEAL AVE
MYER RD
OAKRIDGE DR
PINE CREST DR
EDWARD ST
N FIRST ST
RADIO HILL RD
RADIO HILL RD
ILLINOIS AVE
MAIN ST
NYMAN AVE
SIXTH ST
ROYNONA RD
HAYWARD CT
FIFTH ST
POPPE RD
HAMBLIN ST
RANCH RD
DAVIS AVE
COUNTY HILL RD
JOHNSON ST
FOURTH ST
DONNELLAN DR
PETERSON RD
THIRD ST
Hayward Lake
BOULDER CT
BEAVER BROOK
DYNO DR
GREENWOOD LN
LAKE DR
LEIN RD
LINDHOLM DR (2)
B
RIVERS EDGE DR
HEINZ RD
LEE RD
ROCK CREEK RD
TOWNE VIEW RD
METCALF RD
OLKER RD
NURSERY RD
LAURA DR
WINTER DR
RICKCO LN
ABBY LN
STRESS RD
WHEELER BROOK
NAMEKAGON RIVER
RAVEN RD
63
OGREN RD
CAROL DR
SPRING LAKE CREEK
BENSON RD
CINDY AVE
27
KADLEC RD
PFEISTER DR
PARK RD
FAIRWAY RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
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OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
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FIRE & EMS
HOSPITAL
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U.S. HIGHWAY
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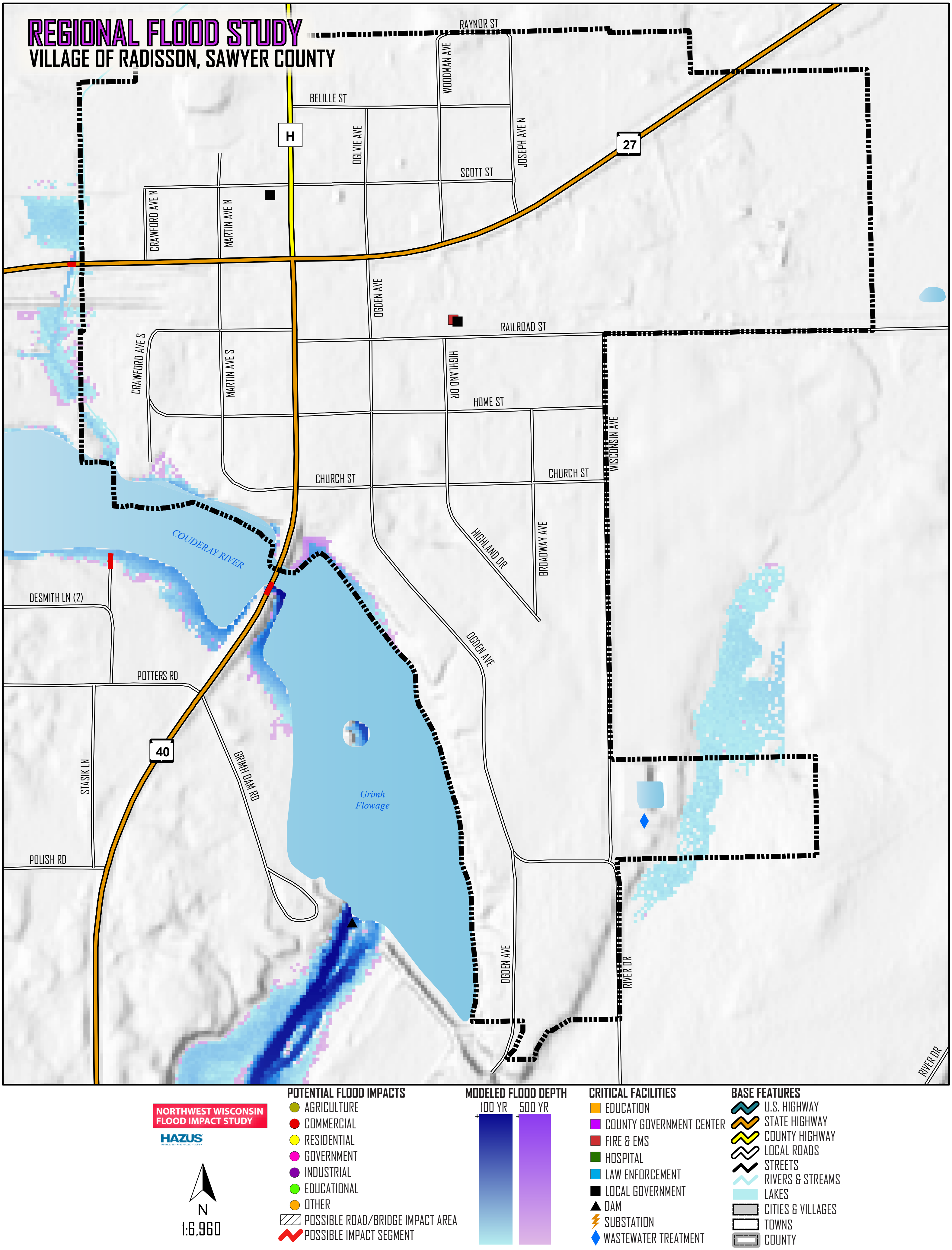
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF RADISSON, SAWYER COUNTY
RAYNOR ST
BELILLE ST
WOODMAN AVE
OGLVIE AVE
JOSEPH AVE N
SCOTT ST
CRAWFORD AVE N
MARTIN AVE N
H
27
OGDEN AVE
RAILROAD ST
CRAWFORD AVE S
MARTIN AVE S
HIGHLAND DR
HOME ST
WISCONSIN AVE
CHURCH ST
CHURCH ST
HIGHLAND DR
BROADWAY AVE
COUDERAY RIVER
DESMITH LN (2)
OGDEN AVE
POTTERS RD
GRIMH DAM RD
40
STASIK LN
Grimh Flowage
POLISH RD
OGDEN AVE
RIVER DR
RIVER DR
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
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OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
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FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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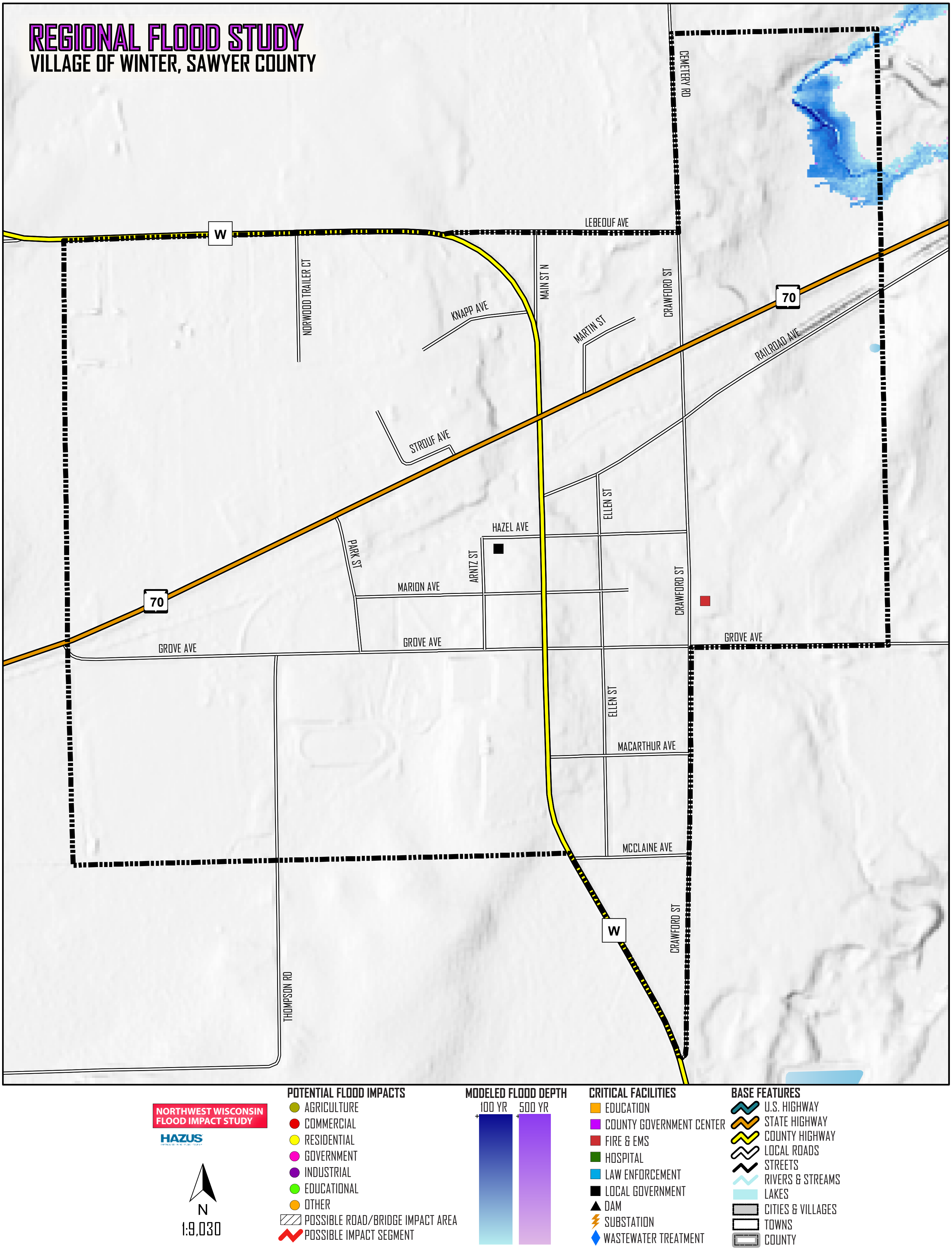
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
VILLAGE OF WINTER, SAWYER COUNTY
CEMETERY RD
LEBEOUF AVE
W
NORWOOD TRAILER CT
MAIN ST N
CRAWFORD ST
KNAPP AVE
MARTIN ST
70
RAILROAD AVE
STROUF AVE
ELLEN ST
HAZEL AVE
PARK ST
ARNTZ ST
MARION AVE
CRAWFORD ST
GROVE AVE
GROVE AVE
GROVE AVE
ELLEN ST
MACARTHUR AVE
MCCLAINE AVE
CRAWFORD ST
THOMPSON RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
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BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

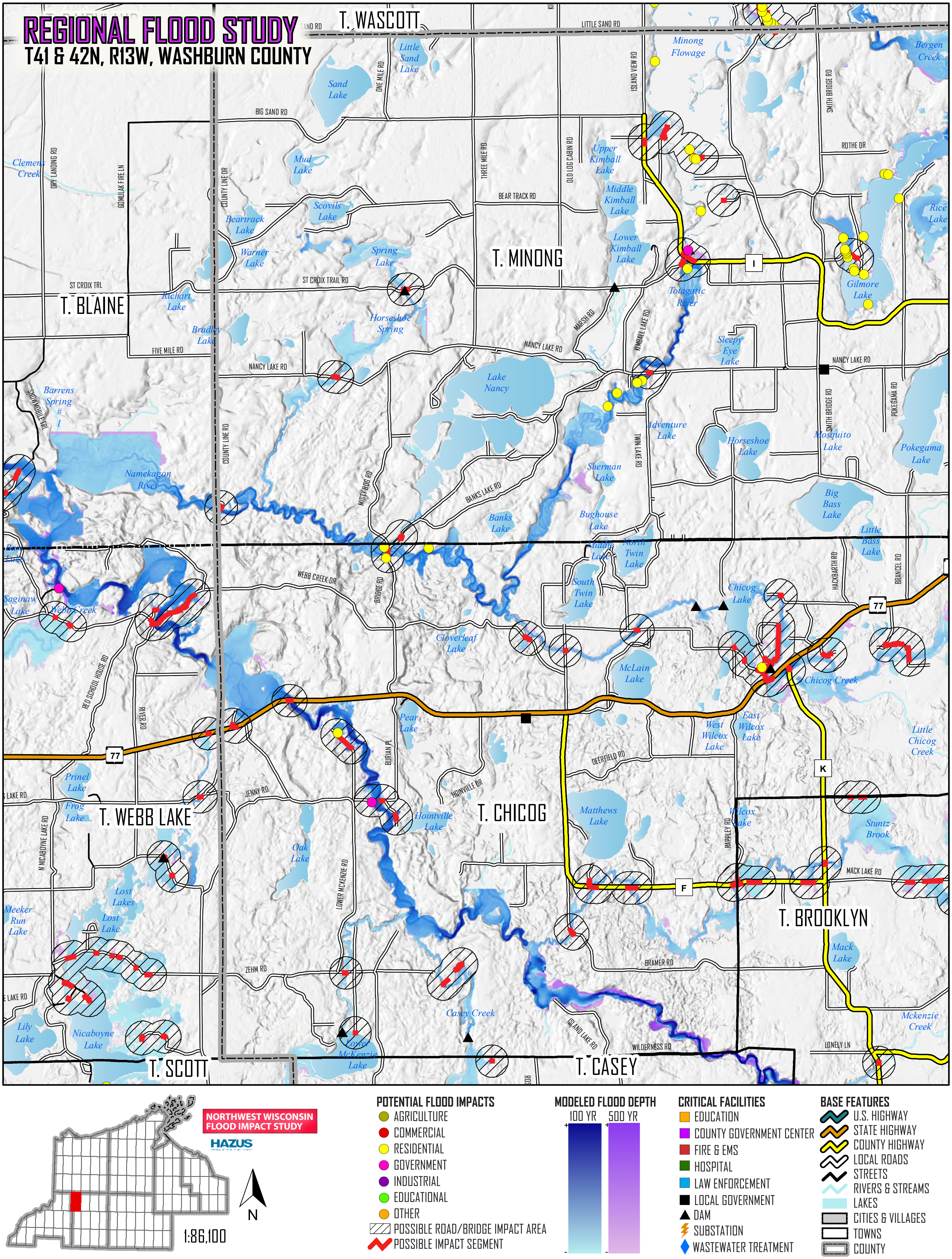
WASHBURN COUNTY

HAZUS 100-YEAR FLOOD LOSS ESTIMATES - WASHBURN COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF SHELL LAKE	50	$ 603,169.00	$ 468,019.00	$ 6,639.00	527
C. OF SPOONER	10	$ 29,239.00	$ 141,682.00	$ -	281
T. OF BARRONETT	1	$ 87.00	$ 2,004.00	$ 464.00	121
T. OF BASHAW	2	$ 41,527.00	$ 12,650.00	$ -	34
T. OF BASS LAKE	1	$ -	$ -	$ -	7
T. OF BIRCHWOOD	1	$ 138,917.00	$ 69,137.00	$ -	37
T. OF CASEY	5	$ 42,281.00	$ 15,693.00	$ -	25
T. OF CHICOG	6	$ 40,935.00	$ 39,467.00	$ -	31
T. OF CRYSTAL	8	$ 30,235.00	$ 11,488.00	$ -	253
T. OF EVERGREEN	4	$ 18,615.00	$ 7,277.00	$ -	24
T. OF MINONG	12	$ 128,102.00	$ 178,247.00	$ -	71
T. OF SPOONER	6	$ 27,356.00	$ 10,653.00	$ -	32
T. OF SPRINGBROOK	1	$ -	$ -	$ -	5
T. OF STONE LAKE	1	$ -	$ -	$ -	3
T. OF TREGO	64	$ 1,849,403.00	$ 792,291.00	$ -	523
V. OF BIRCHWOOD	13	$ 160,202.00	$ 67,720.00	$ -	120
V. OF MINONG	21	$ 19,711.00	$ 49,258.00	$ 34,252.00	111
GRAND TOTAL	**206**	**$ 3,129,779.00**	**$ 1,865,586.00**	**$ 41,355.00**	**2,205**

HAZUS 500-YEAR FLOOD LOSS ESTIMATES - WASHBURN COUNTY

Municipality	Structures Impacted	Estimated Building Losses	Estimated Content Losses	Estimated Inventory Losses	Debris Generated (tons)
C. OF SHELL LAKE	64	$ 1,176,475.00	$ 1,513,642.00	$ 146,416.00	784
C. OF SPOONER	13	$ 101,451.00	$ 192,011.00	$ -	306
T. OF BARRONETT	1	$ 571.00	$ 3,132.00	$ 3,037.00	121
T. OF BASHAW	4	$ 52,899.00	$ 16,408.00	$ -	91
T. OF BASS LAKE	3	$ 41,358.00	$ 12,012.00	$ -	38
T. OF BIRCHWOOD	1	$ 166,181.00	$ 80,020.00	$ -	37
T. OF CASEY	7	$ 52,944.00	$ 19,359.00	$ -	38
T. OF CHICOG	6	$ 104,648.00	$ 66,486.00	$ -	35
T. OF CRYSTAL	13	$ 40,996.00	$ 17,181.00	$ 1,216.00	461
T. OF EVERGREEN	4	$ 59,972.00	$ 22,873.00	$ -	24
T. OF LONG LAKE	1	$ -	$ -	$ -	7
T. OF MINONG	28	$ 534,049.00	$ 306,735.00	$ -	240
T. OF SPOONER	10	$ 143,252.00	$ 60,687.00	$ -	64
T. OF SPRINGBROOK	2	$ 13,103.00	$ 9,964.00	$ -	7
T. OF STINNETT	2	$ -	$ -	$ -	8
T. OF STONE LAKE	1	$ 1,503.00	$ 591.00	$ -	3
T. OF TREGO	79	$ 2,710,953.00	$ 1,116,618.00	$ -	901
V. OF BIRCHWOOD	15	$ 262,634.00	$ 104,403.00	$ -	146
V. OF MINONG	33	$ 37,014.00	$ 87,456.00	$ 37,950.00	182
GRAND TOTAL	**287**	**$ 5,500,003.00**	**$ 3,629,578.00**	**$ 188,619.00**	**3,493**


REGIONAL FLOOD STUDY
T41 & 42N, R13W, WASHBURN COUNTY
T. WASCOTT
T. MINONG
T. BLAINE
T. WEBB LAKE
T. CHICOG
T. BROOKLYN
T. SCOTT
T. CASEY
Minong Flowage
Bergen Creek
Little Sand Lake
Sand Lake
Mud Lake
Clemens Creek
Scovils Lake
Beartrack Lake
Warner Lake
Spring Lake
Upper Kimball Lake
Middle Kimball Lake
Lower Kimball Lake
Totagatic River
Rice Lake
Gilmore Lake
Richart Lake
Bradley Lake
Horseshoe Spring
Sleepy Eye Lake
Lake Nancy
Barrens Spring # 1
Adventure Lake
Horseshoe Lake
Mosquito Lake
Pokegama Lake
Namekagon River
Sherman Lake
Big Bass Lake
Banks Lake
Bughouse Lake
Little Bass Lake
Middle Lake
North Twin Lake
South Twin Lake
Chicog Lake
Saginaw Lake
Webb Creek
Cloverleaf Lake
McLain Lake
Chicog Creek
Pear Lake
West Wilcox Lake
East Wilcox Lake
Little Chicog Creek
Prinel Lake
Frog Lake
Hointville Lake
Matthews Lake
Wilcox Lake
Stuntz Brook
Oak Lake
Lost Lakes
Lost Lake
Meeker Run Lake
Mack Lake
Casey Creek
Lily Lake
Nicaboyne Lake
Lower McKenzie Lake
Mckenzie Creek
LITTLE SAND RD
BIG SAND RD
ONE MILE RD
ISLAND VIEW RD
SMITH BRIDGE RD
ROTHE DR
DRY LANDING RD
GOMULAK FIRE LN
COUNTY LINE DR
THREE MILE RD
OLD LOG CABIN RD
BEAR TRACK RD
ST CROIX TRL
ST CROIX TRAIL RD
MARSH RD
KIMBALL LAKE RD
FIVE MILE RD
NANCY LAKE RD
POKEGAMA RD
TWIN LAKE RD
BANKS LAKE RD
MISTY BOG RD
WEBB CREEK DR
BRIDGE RD
HACKBARTH RD
BRANCEL RD
RED SCHOOL HOUSE RD
RIVER RD
BURIAN PL
DEERFIELD RD
HOINVILLE DR
JENNY RD
N NICABOYNE LAKE RD
LOWER MCKENZIE RD
RAPPLEY RD
MACK LAKE RD
BRAMER RD
ZEHM RD
ISLAND LAKE RD
WILDERNESS RD
LONELY LN
77
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K
F
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
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COUNTY
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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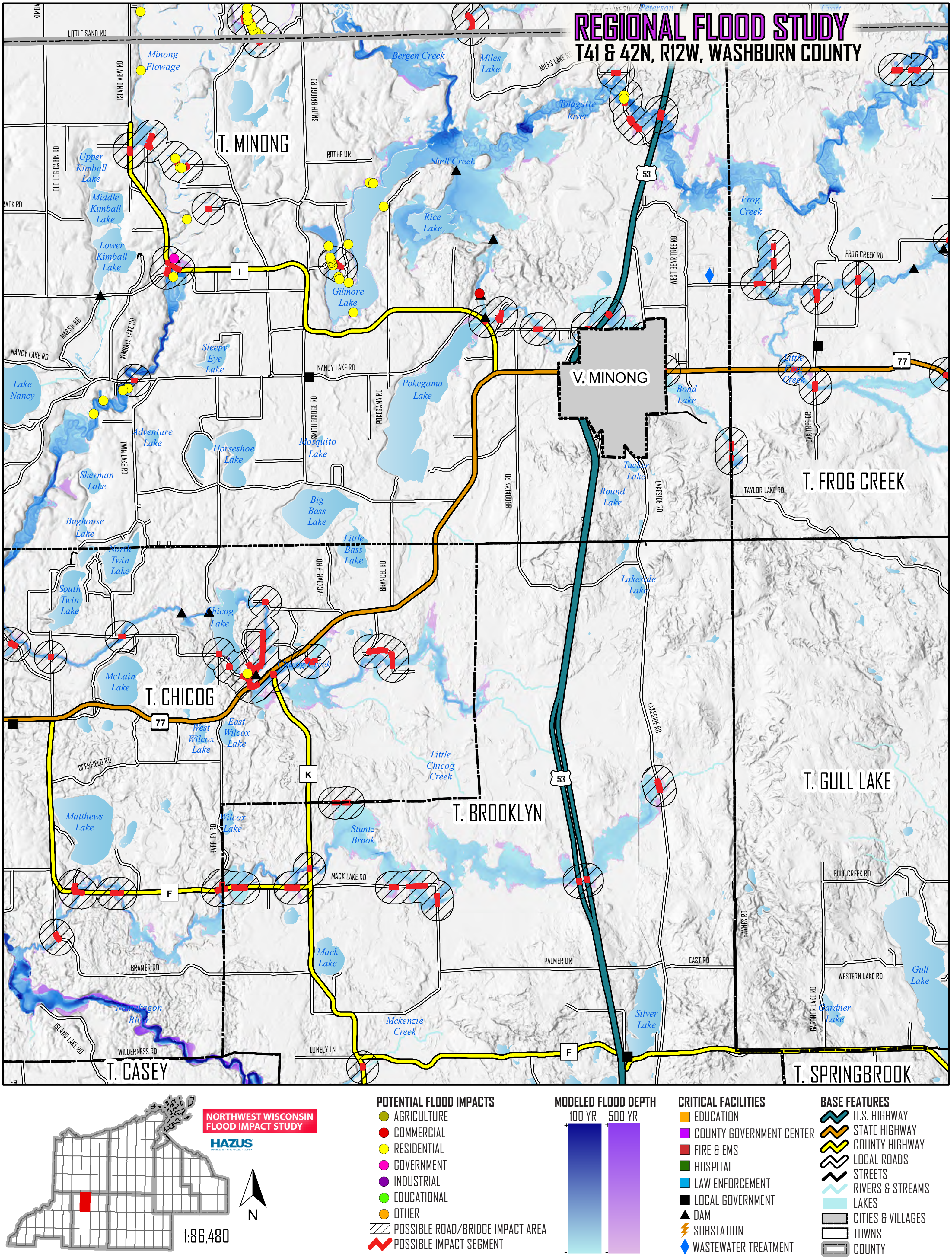
REGIONAL FLOOD STUDY
T41 & 42N, R12W, WASHBURN COUNTY
T. MINONG
V. MINONG
T. FROG CREEK
T. CHICOG
T. BROOKLYN
T. GULL LAKE
T. CASEY
T. SPRINGBROOK
LITTLE SAND RD
ISLAND VIEW RD
OLD LOG CABIN RD
SMITH BRIDGE RD
ROTHE DR
MARSH RD
KIMBALL LAKE RD
NANCY LAKE RD
POKEGAMA RD
TWIN LAKE RD
BROOKLYN RD
LAKESIDE RD
WEST BEAR TREE RD
FROG CREEK RD
OAK TREE DR
TAYLOR LAKE RD
HACKBARTH RD
BRANCEL RD
DEERFIELD RD
RAPPLEY RD
MACK LAKE RD
BRAMER RD
ISLAND LAKE RD
WILDERNESS RD
LONELY LN
PALMER DR
EAST RD
HAYNES RD
GULL CREEK RD
WESTERN LAKE RD
GARDNER LAKE RD
MILES LAKE RD
Minong Flowage
Upper Kimball Lake
Middle Kimball Lake
Lower Kimball Lake
Bergen Creek
Miles Lake
Totagatic River
Shell Creek
Rice Lake
Gilmore Lake
Frog Creek
Lake Nancy
Sleepy Eye Lake
Pokegama Lake
Adventure Lake
Horseshoe Lake
Mosquito Lake
Sherman Lake
Bughouse Lake
Big Bass Lake
Little Bass Lake
North Twin Lake
South Twin Lake
Chicog Lake
McLain Lake
West Wilcox Lake
East Wilcox Lake
Little Frog Creek
Bond Lake
Tucker Lake
Round Lake
Lakeside Lake
Little Chicog Creek
Matthews Lake
Wilcox Lake
Stuntz Brook
Mack Lake
Namekagon River
Mckenzie Creek
Silver Lake
Gardner Lake
Gull Lake
53
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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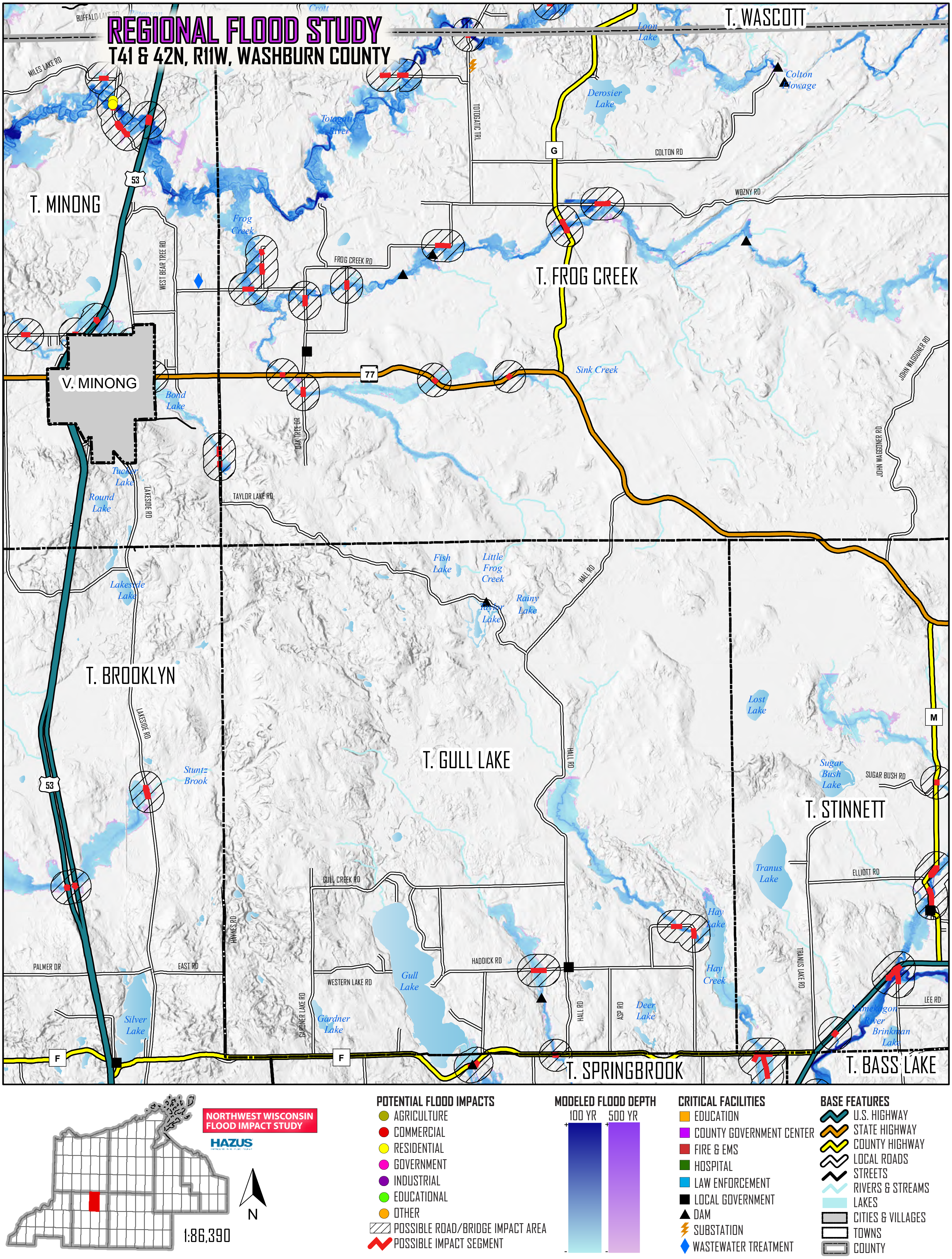
REGIONAL FLOOD STUDY
T41 & 42N, R11W, WASHBURN COUNTY
T. WASCOTT
T. MINONG
T. FROG CREEK
V. MINONG
T. BROOKLYN
T. GULL LAKE
T. STINNETT
T. SPRINGBROOK
T. BASS LAKE
MILES LAKE RD
BUFFALO LAKE RD
TOTOGATIC TRL
COLTON RD
WOZNY RD
WEST BEAR TREE RD
FROG CREEK RD
OAK TREE DR
TAYLOR LAKE RD
LAKESIDE RD
HALL RD
JOHN WAGGONER RD
SUGAR BUSH RD
ELLIOTT RD
GULL CREEK RD
HAYNES RD
HADDICK RD
WESTERN LAKE RD
GARDNER LAKE RD
ASP RD
TRANUS LAKE RD
LEE RD
PALMER DR
EAST RD
Loon Lake
Colton Flowage
Derosier Lake
Totogatic River
Frog Creek
Sink Creek
Bond Lake
Tucker Lake
Round Lake
Fish Lake
Little Frog Creek
Rainy Lake
Taylor Lake
Lakeside Lake
Lost Lake
Sugar Bush Lake
Stuntz Brook
Tranus Lake
Hay Lake
Hay Creek
Gull Lake
Gardner Lake
Deer Lake
Silver Lake
Namekagon River
Brinkman Lake
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M
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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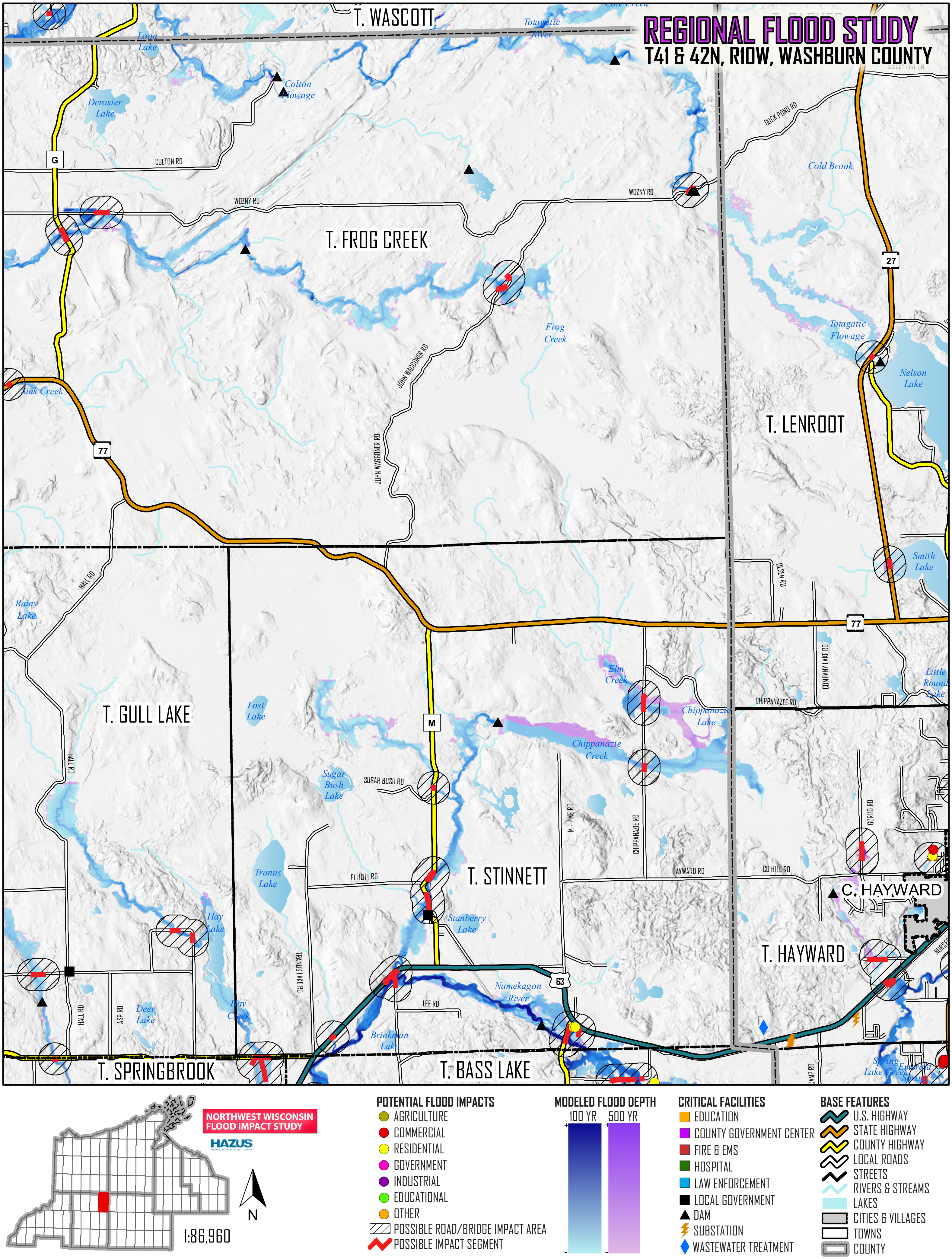
COUNTY


REGIONAL FLOOD STUDY
T41 & 42N, R10W, WASHBURN COUNTY
T. WASCOTT
T. FROG CREEK
T. LENROOT
T. GULL LAKE
T. STINNETT
T. HAYWARD
C. HAYWARD
T. SPRINGBROOK
T. BASS LAKE
Loon Lake
Colton Flowage
Derosier Lake
Totagatic River
Cold Brook
Frog Creek
Totagatic Flowage
Nelson Lake
Sink Creek
Smith Lake
Rainy Lake
Little Round Lake
Elm Creek
Chippanazie Lake
Chippanazie Creek
Lost Lake
Sugar Bush Lake
Tranus Lake
Stanberry Lake
Hay Lake
Hay Creek
Deer Lake
Namekagon River
Brinkman Lake
Spring Lake
Emerald Springs
COLTON RD
WOZNY RD
DUCK POND RD
JOHN WAGGONER RD
HALL RD
OLSEN RD
COMPANY LAKE RD
CHIPPANAZEE RD
SUGAR BUSH RD
M - PIKE RD
CHIPPANAZIE RD
GORUDD RD
ELLIOTT RD
HAYWARD RD
CO HILL RD
TRANUS LAKE RD
LEE RD
ASP RD
CAMP RD
G
M
27
77
63
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
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HAZUS
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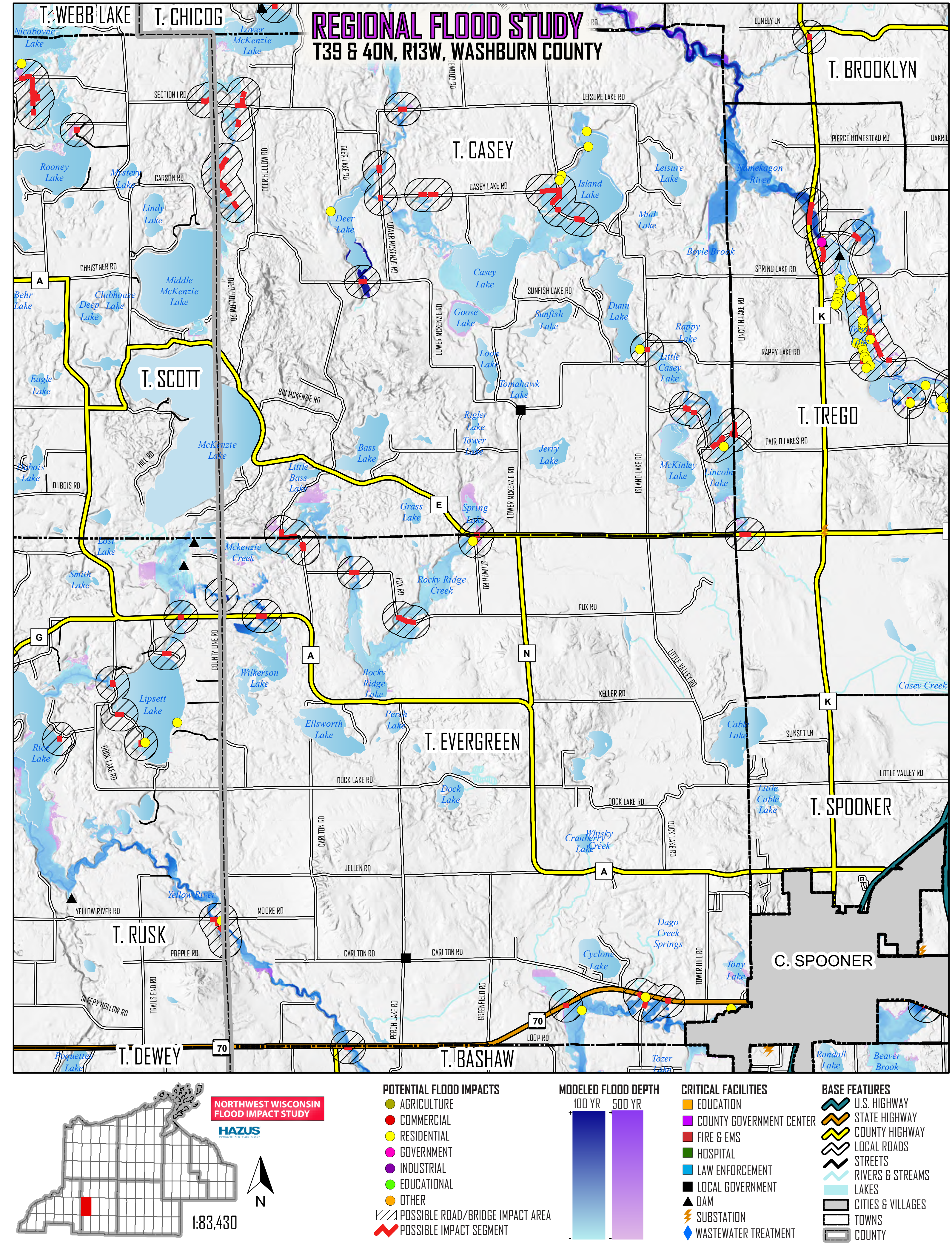
REGIONAL FLOOD STUDY
T39 & 40N, R13W, WASHBURN COUNTY
T. WEBB LAKE
T. CHICOG
T. BROOKLYN
T. CASEY
T. SCOTT
T. TREGO
T. EVERGREEN
T. SPOONER
T. RUSK
T. DEWEY
T. BASHAW
C. SPOONER
Nicaboyne Lake
Lower McKenzie Lake
Rooney Lake
Mystery Lake
Lindy Lake
Middle McKenzie Lake
Behr Lake
Clubhouse Lake
Deep Lake
Eagle Lake
McKenzie Lake
Dubois Lake
Lost Lake
Smith Lake
Deer Lake
Island Lake
Leisure Lake
Mud Lake
Namekagon River
Boyle Brook
Casey Lake
Goose Lake
Sunfish Lake
Dunn Lake
Rappy Lake
Little Casey Lake
Loon Lake
Tomahawk Lake
Rigler Lake
Tower Lake
Jerry Lake
Bass Lake
Little Bass Lake
McKinley Lake
Lincoln Lake
Trego Lake
Grass Lake
Spring Lake
Mckenzie Creek
Rocky Ridge Creek
Wilkerson Lake
Rocky Ridge Lake
Lipsett Lake
Rice Lake
Ellsworth Lake
Perch Lake
Cable Lake
Little Cable Lake
Dock Lake
Cranberry Lake
Whisky Creek
Casey Creek
Yellow River
Dago Creek Springs
Cyclone Lake
Tony Lake
Tozer Lake
Randall Lake
Beaver Brook
Paquette Lake
SECTION 1 RD
CARSON RD
CHRISTNER RD
DEER HOLLOW RD
DEER LAKE RD
LOWER MCKENZIE RD
CASEY LAKE RD
LEISURE LAKE RD
LONELY LN
PIERCE HOMESTEAD RD
SPRING LAKE RD
SUNFISH LAKE RD
LINCOLN LAKE RD
RAPPY LAKE RD
PAIR O LAKES RD
BIG MCKENZIE RD
HILL RD
DUBOIS RD
ISLAND LAKE RD
FOX RD
STUMPH RD
COUNTY LINE RD
KELLER RD
LITTLE VALLEY RD
SUNSET LN
DOCK LAKE RD
CARLTON RD
JELLEN RD
YELLOW RIVER RD
MOORE RD
POPPLE RD
TRAILS END RD
SLEEPY HOLLOW RD
PERCH LAKE RD
GREENFIELD RD
LOOP RD
TOWER HILL RD
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
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POTENTIAL FLOOD IMPACTS
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MODELED FLOOD DEPTH
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EDUCATION
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LOCAL GOVERNMENT
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BASE FEATURES
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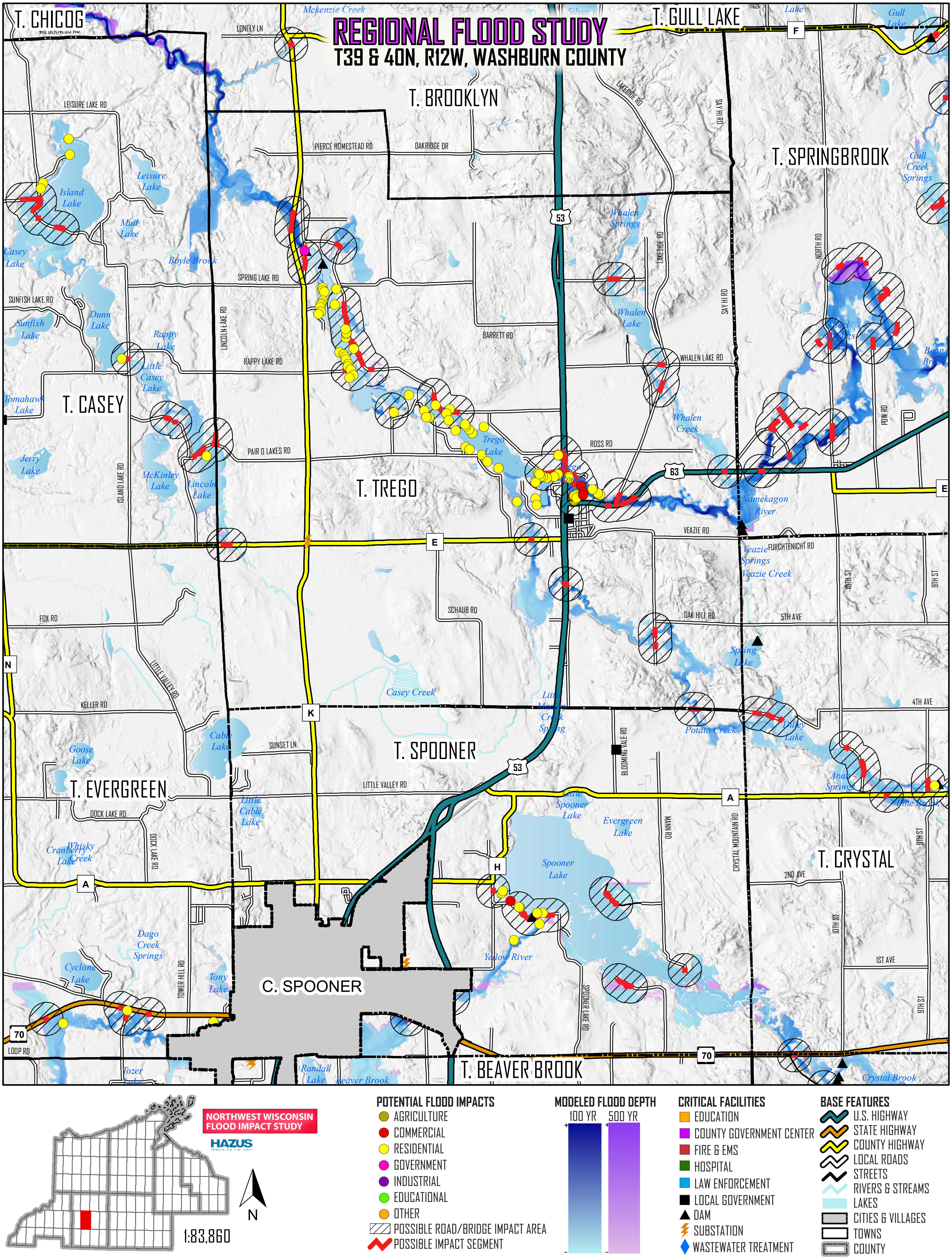
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T39 & 40N, R12W, WASHBURN COUNTY
T. CHICOG
T. GULL LAKE
T. BROOKLYN
T. SPRINGBROOK
T. CASEY
T. TREGO
T. SPOONER
T. EVERGREEN
T. CRYSTAL
T. BEAVER BROOK
C. SPOONER
Mckenzie Creek
Island Lake
Leisure Lake
Mud Lake
Casey Lake
Boyle Brook
Dunn Lake
Sunfish Lake
Rappy Lake
Little Casey Lake
Tomahawk Lake
Jerry Lake
McKinley Lake
Lincoln Lake
Trego Lake
Whalen Springs
Whalen Lake
Whalen Creek
Gull Lake
Gull Creek Springs
Namekagon River
Veazie Springs
Veazie Creek
Spring Lake
Casey Creek
Little Mackay Creek Spring
Potato Creek
Dilley Lake
Cable Lake
Goose Lake
Little Cable Lake
Cranberry Lake
Whisky Creek
Little Spooner Lake
Evergreen Lake
Spooner Lake
Yellow River
Dago Creek Springs
Cyclone Lake
Tony Lake
Randall Lake
Beaver Brook
Tozer Lake
Crystal Brook
LONELY LN
LEISURE LAKE RD
PIERCE HOMESTEAD RD
OAKRIDGE DR
LAKESIDE RD
SAY HI RD
SPRING LAKE RD
SUNFISH LAKE RD
BARRETT RD
RAPPY LAKE RD
LINCOLN LAKE RD
WHALEN LAKE RD
NORTH RD
POW RD
ROSS RD
PAIR O LAKES RD
ISLAND LAKE RD
VEAZIE RD
FURCHTENICHT RD
10TH ST
9TH ST
FOX RD
SCHAUB RD
OAK HILL RD
5TH AVE
LITTLE VALLEY RD
KELLER RD
4TH AVE
SUNSET LN
BLOOMING VALE RD
DOCK LAKE RD
MAIN RD
CRYSTAL MOUNTAIN RD
2ND AVE
1ST AVE
TOWER HILL RD
SPOONER LAKE RD
LOOP RD
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
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RESIDENTIAL
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INDUSTRIAL
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POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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CRITICAL FACILITIES
EDUCATION
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FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
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CITIES & VILLAGES
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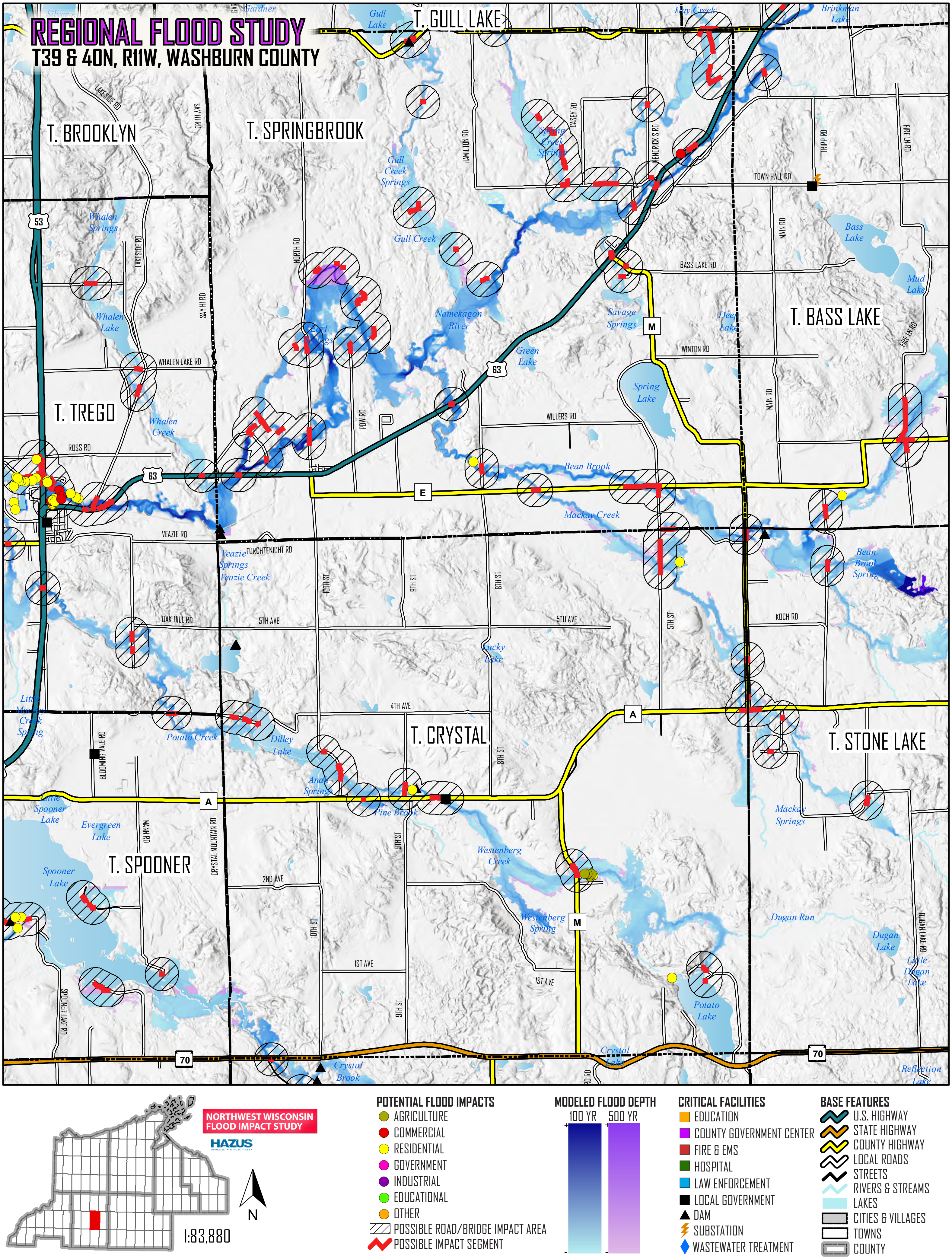
REGIONAL FLOOD STUDY
T39 & 40N, R11W, WASHBURN COUNTY
T. GULL LAKE
T. BROOKLYN
T. SPRINGBROOK
T. TREGO
T. BASS LAKE
T. CRYSTAL
T. STONE LAKE
T. SPOONER
Gull Lake
Gardner
Hay Creek
Brinkman Lake
Gull Creek Springs
Gull Creek
Spring Creek Spring
Namekagon River
Whalen Springs
Whalen Lake
Whalen Creek
Earl Springs
Savage Springs
Green Lake
Deep Lake
Bass Lake
Mud Lake
Spring Lake
Bean Brook
Mackay Creek
Bean Brook Spring
Veazie Springs
Veazie Creek
Lucky Lake
Little Mackay Creek Spring
Potato Creek
Dilley Lake
Anna Springs
Pine Brook
Little Spooner Lake
Evergreen Lake
Spooner Lake
Westenberg Creek
Westenberg Spring
Mackay Springs
Dugan Run
Dugan Lake
Little Dugan Lake
Potato Lake
Crystal Lake
Crystal Brook
Reflection Lake
LAKESIDE RD
SAY HI RD
HAMILTON RD
CASEY RD
HENDRICK'S RD
TOWN HALL RD
TRIPP RD
FIRE LN RD
NORTH RD
BASS LAKE RD
MAIN RD
WINTON RD
WHALEN LAKE RD
WILLERS RD
POW RD
ROSS RD
VEAZIE RD
FURCHTENICHT RD
10TH ST
9TH ST
8TH ST
5TH ST
OAK HILL RD
5TH AVE
KOCH RD
4TH AVE
BLOOMING VALE RD
CRYSTAL MOUNTAIN RD
MANN RD
2ND AVE
1ST AVE
SPOONER LAKE RD
DUGAN LAKE RD
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
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OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
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WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
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RIVERS & STREAMS
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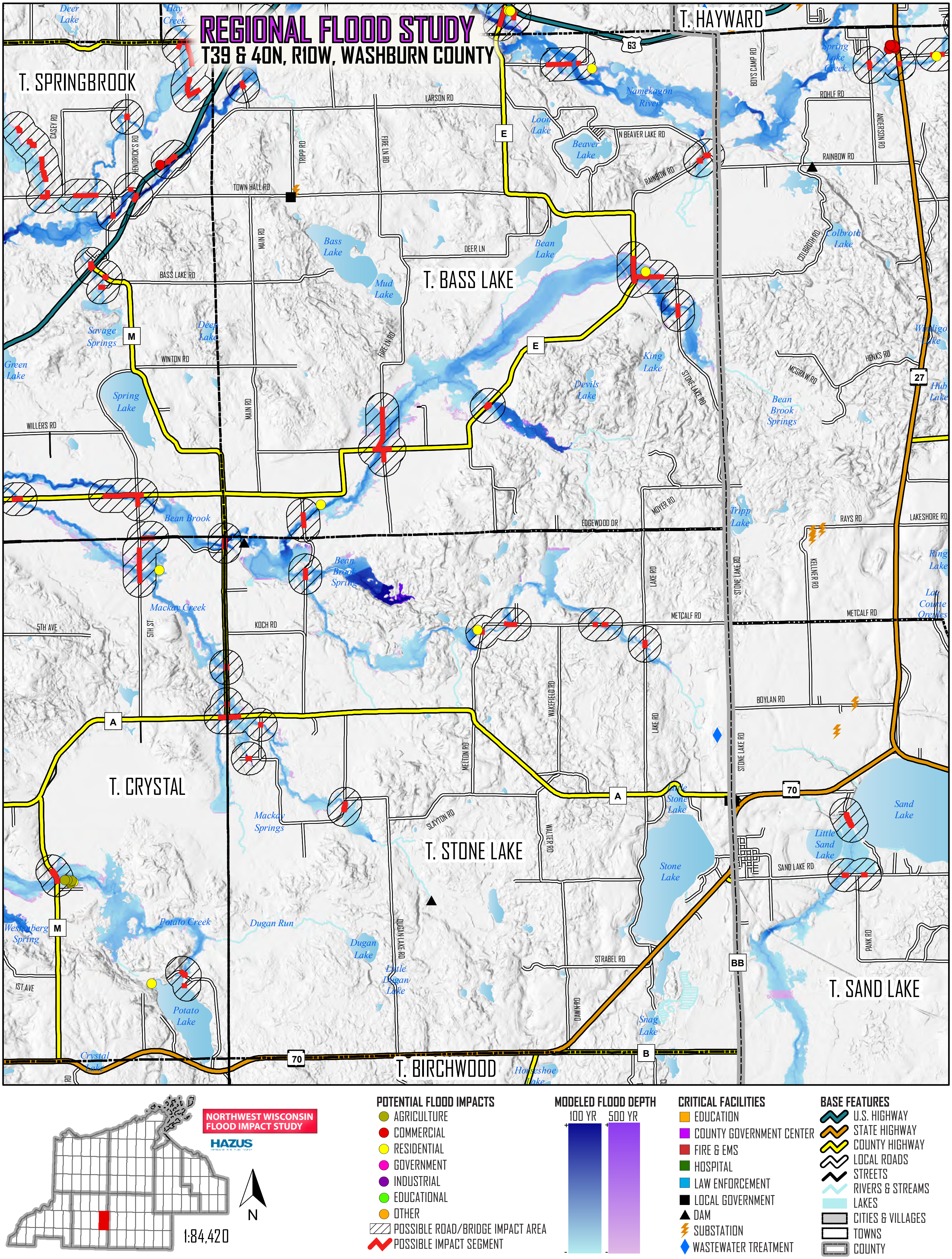
REGIONAL FLOOD STUDY
T39 & 40N, R10W, WASHBURN COUNTY
T. SPRINGBROOK
T. HAYWARD
T. BASS LAKE
T. CRYSTAL
T. STONE LAKE
T. SAND LAKE
T. BIRCHWOOD
Deer Lake
Hay Creek
Namekagon River
Spring Lake Creek
Loon Lake
Beaver Lake
Bass Lake
Mud Lake
Bean Lake
Colbroth Lake
Savage Springs
Deep Lake
Green Lake
Spring Lake
King Lake
Devils Lake
Bean Brook Springs
Whitefish Lake
Hub Lake
Bean Brook
Tripp Lake
Ring Lake
Lac Courte Oreilles
Mackay Creek
Mackay Springs
Little Stone Lake
Stone Lake
Sand Lake
Little Sand Lake
Westenberg Spring
Potato Creek
Dugan Run
Dugan Lake
Little Dugan Lake
Potato Lake
Snag Lake
Crystal Lake
Horseshoe Lake
LARSON RD
TOWN HALL RD
TRIPP RD
FIRE LN RD
N BEAVER LAKE RD
RAINBOW RD
ROHLF RD
ANDERSON RD
BOYS CAMP RD
CASEY RD
HENDRICK'S RD
BASS LAKE RD
MAIN RD
DEER LN
COLBROTH RD
WINTON RD
STONE LAKE RD
HENKS RD
MCGRAW RD
WILLERS RD
EDGEWOOD DR
MOYER RD
RAYS RD
LAKESHORE RD
KELLNER RD
LAKE RD
METCALF RD
5TH AVE
5TH ST
KOCH RD
WAKEFIELD RD
BOYLAN RD
MELTON RD
SLAYTON RD
WALTER RD
SAND LAKE RD
PARK RD
DUGAN LAKE RD
STRABEL RD
DAWN RD
1ST AVE
63
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BB
B
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
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COUNTY
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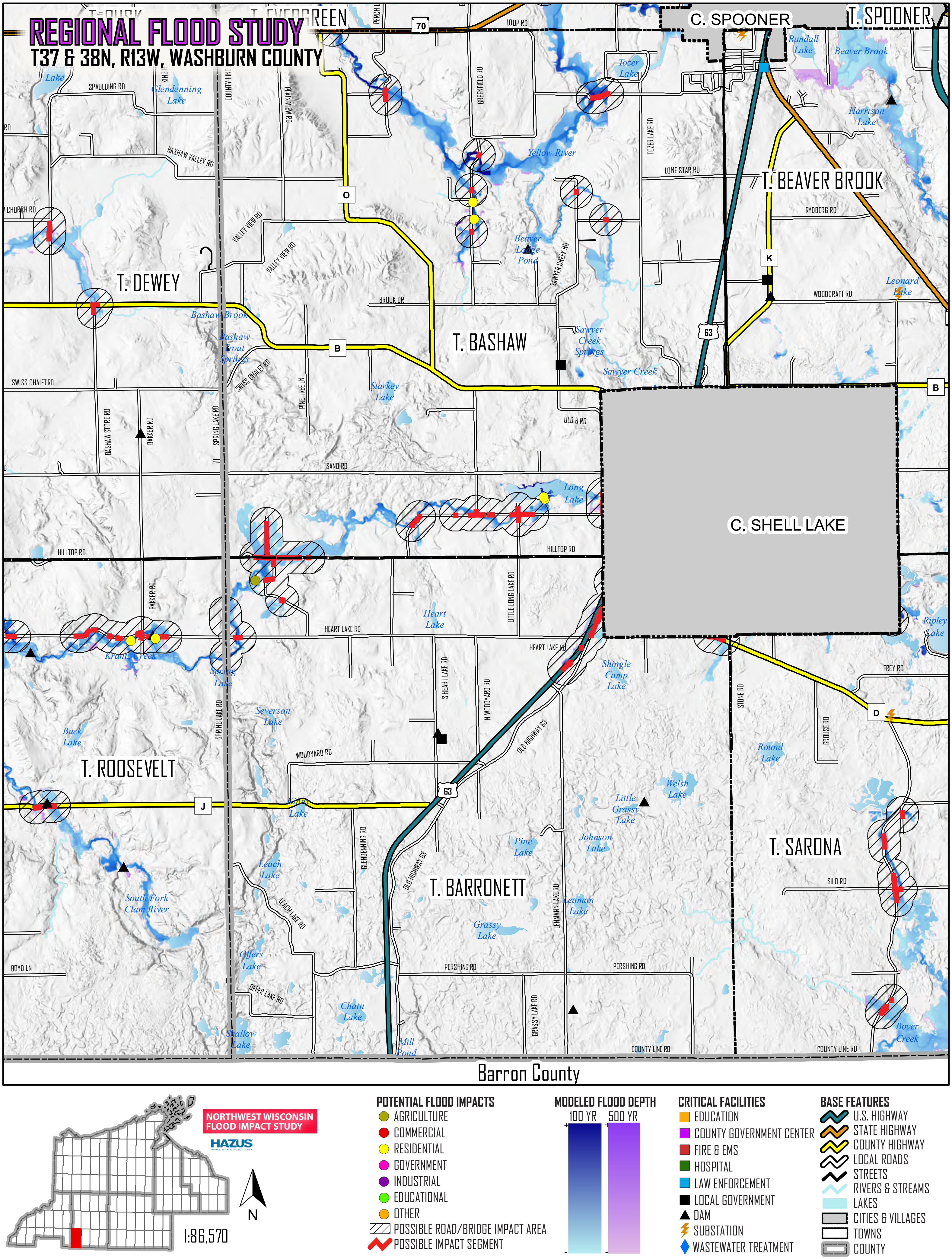
REGIONAL FLOOD STUDY
T37 & 38N, R13W, WASHBURN COUNTY
T. EVERGREEN
C. SPOONER
T. SPOONER
T. DEWEY
T. BASHAW
T. BEAVER BROOK
C. SHELL LAKE
T. ROOSEVELT
T. BARRONETT
T. SARONA
Barron County
Clendenning Lake
Yellow River
Tozer Lake
Randall Lake
Beaver Brook
Harrison Lake
Beaver Lodge Pond
Leonard Lake
Bashaw Brook
Bashaw Trout Springs
Sawyer Creek Springs
Sawyer Creek
Starkey Lake
Long Lake
Heart Lake
Ripley Lake
Krantz Creek
Spring Lake
Shingle Camp Lake
Severson Lake
Buck Lake
Round Lake
Welsh Lake
Little Grassy Lake
Johnson Lake
Pine Lake
Leach Lake
South Fork Clam River
Leaman Lake
Grassy Lake
Offers Lake
Chain Lake
Shallow Lake
Mill Pond
Boyer Creek
SPAULDING RD
BASHAW VALLEY RD
CHURCH RD
COUNTY LINE
PLAINVIEW RD
GREENFIELD RD
LOOP RD
TOZER LAKE RD
LONE STAR RD
RYDBERG RD
WOODCRAFT RD
VALLEY VIEW RD
BROOK DR
SAWYER CREEK RD
SWISS CHALET RD
PINE TREE LN
BASHAW STORE RD
BAKKER RD
SPRING LAKE RD
SAND RD
OLD B RD
HILLTOP RD
HEART LAKE RD
LITTLE LONG LAKE RD
S HEART LAKE RD
N WOODYARD RD
OLD HIGHWAY 63
STONE RD
GROUSE RD
FREY RD
WOODYARD RD
GLENDENNING RD
LEACH LAKE RD
LEHMANN LAKE RD
SILO RD
BOYD LN
PERSHING RD
OFFER LAKE RD
GRASSY LAKE RD
COUNTY LINE RD
70
O
K
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63
D
J
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY
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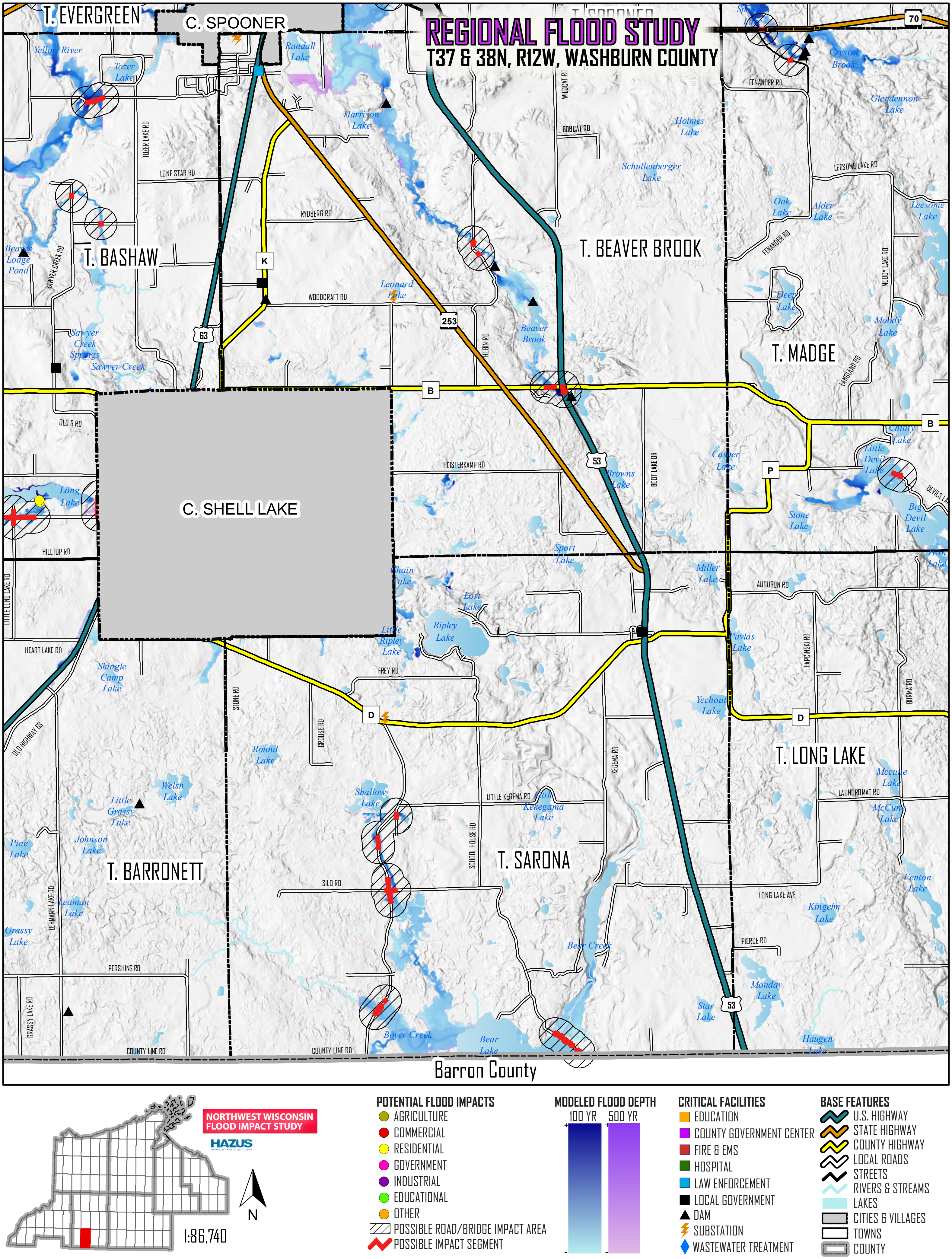
REGIONAL FLOOD STUDY
T37 & 38N, R12W, WASHBURN COUNTY
T. EVERGREEN
C. SPOONER
T. SPOONER
T. BASHAW
T. BEAVER BROOK
T. MADGE
C. SHELL LAKE
T. LONG LAKE
T. SARONA
T. BARRONETT
Barron County
Yellow River
Tozer Lake
Randall Lake
Harrison Lake
Holmes Lake
Schullenberger Lake
Crystal Brook
Glendennon Lake
Oak Lake
Alder Lake
Leesome Lake
Beaver Lodge Pond
Leonard Lake
Beaver Brook
Deep Lake
Moody Lake
Sawyer Creek Springs
Sawyer Creek
Chitty Lake
Little Devil Lake
Casper Lake
Browns Lake
Long Lake
Stone Lake
Big Devil Lake
Sport Lake
Twin Lake
Miller Lake
Chain Lake
Lost Lake
Ripley Lake
Little Ripley Lake
Pavlas Lake
Shingle Camp Lake
Yechout Lake
Round Lake
Welsh Lake
Shallow Lake
Little Kekegama Lake
Little Grassy Lake
Mccune Lake
McCune Lake
Pine Lake
Johnson Lake
Fenton Lake
Leaman Lake
Kingelm Lake
Grassy Lake
Bear Creek
Monday Lake
Star Lake
Boyer Creek
Bear Lake
Haugen Lake
FENANDER RD
WILDCAT RD
BOBCAT RD
TOZER LAKE RD
LONE STAR RD
LEESOME LAKE RD
RYDBERG RD
SAWYER CREEK RD
MOODY LAKE RD
WOODCRAFT RD
HUBIN RD
LANGLAND RD
OLD B RD
HEISTERKAMP RD
BOOT LAKE DR
DEVILS LA
HILLTOP RD
AUDUBON RD
LITTLE LONG LAKE RD
HEART LAKE RD
FREY RD
LAPCINSKI RD
BURMA RD
STONE RD
GROUSE RD
OLD HIGHWAY 63
KEGEMA RD
LITTLE KEGEMA RD
LAUNDROMAT RD
SCHOOL HOUSE RD
SILO RD
LONG LAKE AVE
LEHMANN LAKE RD
PIERCE RD
PERSHING RD
GRASSY LAKE RD
COUNTY LINE RD
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NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
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CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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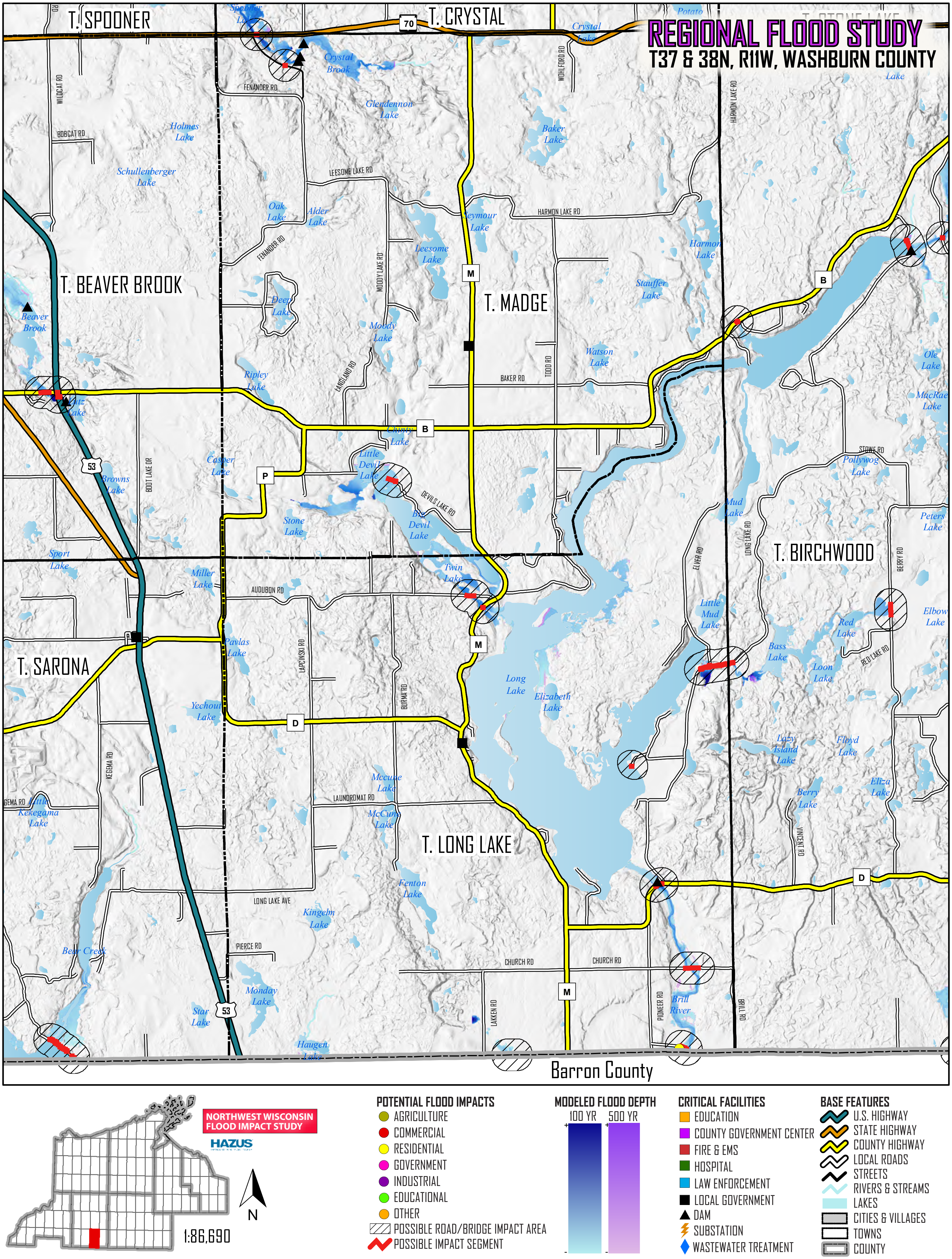
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R11W, WASHBURN COUNTY
T. SPOONER
T. CRYSTAL
T. BEAVER BROOK
T. MADGE
T. BIRCHWOOD
T. SARONA
T. LONG LAKE
Barron County
Spooner Lake
Crystal Brook
Crystal Lake
Glendennon Lake
Holmes Lake
Baker Lake
Schullenberger Lake
Oak Lake
Alder Lake
Seymour Lake
Leesome Lake
Harmon Lake
Stauffer Lake
Deep Lake
Beaver Brook
Moody Lake
Watson Lake
Ripley Lake
Ole Lake
MacRae Lake
Katz Lake
Chippy Lake
Little Devil Lake
Casper Lake
Browns Lake
Pollywog Lake
Mud Lake
Peters Lake
Stone Lake
Big Devil Lake
Sport Lake
Miller Lake
Twin Lake
Little Mud Lake
Elbow Lake
Red Lake
Bass Lake
Loon Lake
Pavlas Lake
Long Lake
Elizabeth Lake
Yechout Lake
Lazy Island Lake
Floyd Lake
Mccune Lake
Eliza Lake
Berry Lake
Little Kekegama Lake
McCune Lake
Fenton Lake
Kingelm Lake
Bear Creek
Monday Lake
Star Lake
Brill River
Haugen Lake
Potato
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FENANDER RD
WILDCAT RD
BOBCAT RD
LEESOME LAKE RD
HARMON LAKE RD
WOHLFORD RD
HARMON LAKE RD
MOODY LAKE RD
LANGLAND RD
BAKER RD
TODD RD
DEVILS LAKE RD
BOOT LAKE DR
STOWE RD
LONG LAKE RD
ELVER RD
BERRY RD
RED LAKE RD
AUDUBON RD
LAPCINSKI RD
BURMA RD
KEGEMA RD
LAUNDROMAT RD
VINCENT RD
LONG LAKE AVE
PIERCE RD
CHURCH RD
LAKKEN RD
PIONEER RD
BRILL RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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POTENTIAL FLOOD IMPACTS
AGRICULTURE
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POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
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EDUCATION
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FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
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SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
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COUNTY HIGHWAY
LOCAL ROADS
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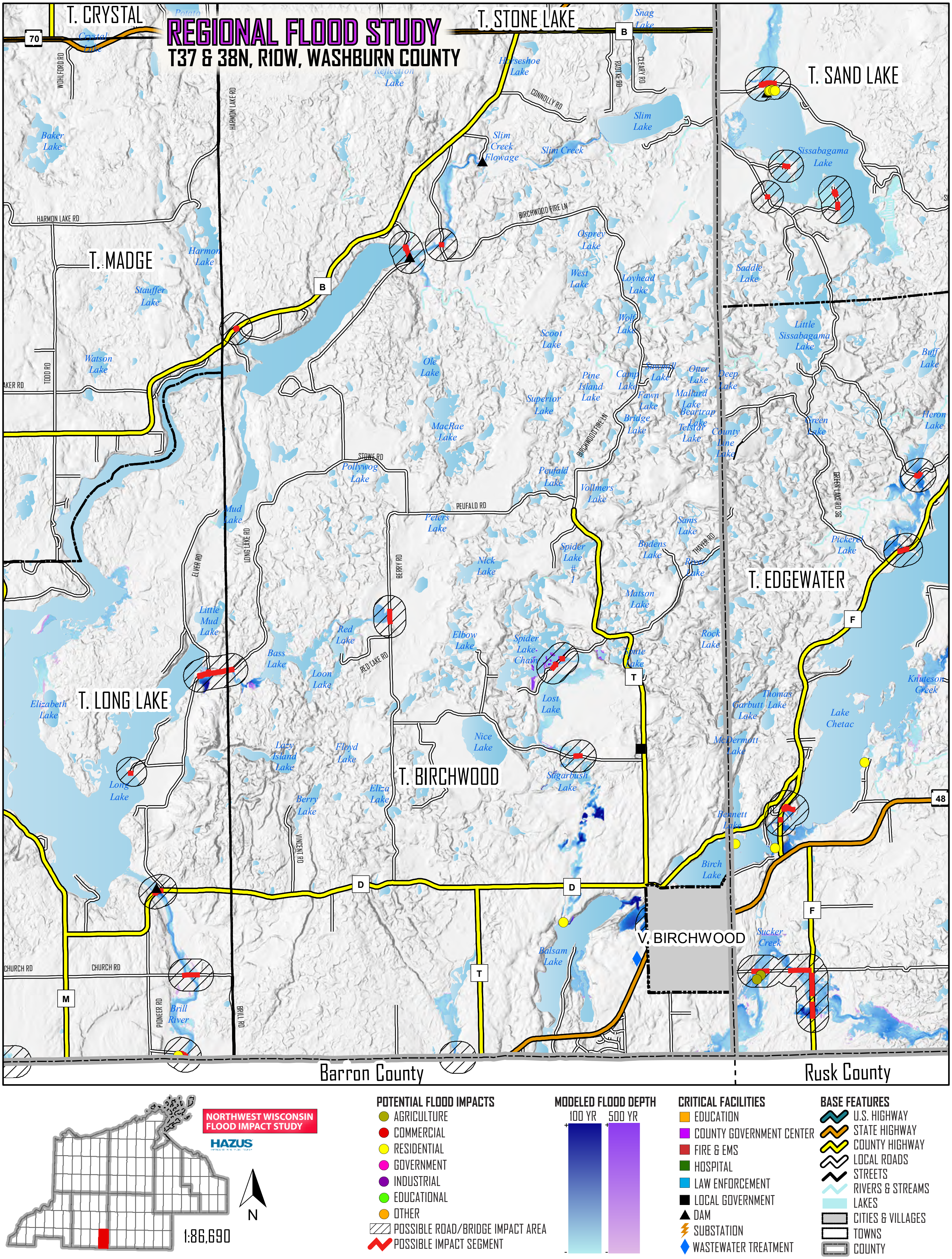
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
T37 & 38N, R10W, WASHBURN COUNTY
T. CRYSTAL
T. STONE LAKE
T. SAND LAKE
T. MADGE
T. LONG LAKE
T. BIRCHWOOD
T. EDGEWATER
V. BIRCHWOOD
Barron County
Rusk County
Crystal Lake
Potato
Snag Lake
Horseshoe Lake
Reflection Lake
Slim Lake
Slim Creek Flowage
Slim Creek
Sissabagama Lake
Baker Lake
Harmon Lake
Stauffer Lake
Watson Lake
Osprey Lake
West Lake
Loyhead Lake
Saddle Lake
Wolf Lake
Scoot Lake
Little Sissabagama Lake
Buff Lake
Ole Lake
Pine Island Lake
Camp Lake
Sawmill Lake
Otter Lake
Deep Lake
Fawn Lake
Mallard Lake
Beartrap Lake
Superior Lake
Bridge Lake
Telstar Lake
County Line Lake
Green Lake
Heron Lake
MacRae Lake
Pollywog Lake
Peufald Lake
Vollmers Lake
Mud Lake
Peters Lake
Sams Lake
Spider Lake
Budens Lake
Pickerel Lake
Nick Lake
River Lake
Matson Lake
Little Mud Lake
Red Lake
Elbow Lake
Spider Lake Chain
Rock Lake
Bass Lake
Loon Lake
Spute Lake
Knuteson Creek
Elizabeth Lake
Lost Lake
Thomas Lake
Garbutt Lake
Lake Chetac
Lazy Island Lake
Floyd Lake
Nice Lake
McDermott Lake
Long Lake
Sugarbush Lake
Berry Lake
Eliza Lake
Bennett Lake
Birch Lake
Balsam Lake
Sucker Creek
Brill River
70
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HARMON LAKE RD
WOHLFORD RD
CONNOLLY RD
BIRCHWOOD FIRE LN
RADTKE RD
CLEARY RD
TODD RD
STOWE RD
PEUFALD RD
ELVER RD
LONG LAKE RD
BERRY RD
RED LAKE RD
THAYER RD
GREEN LAKE RD 36
VINCENT RD
CHURCH RD
PIONEER RD
BRILL RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
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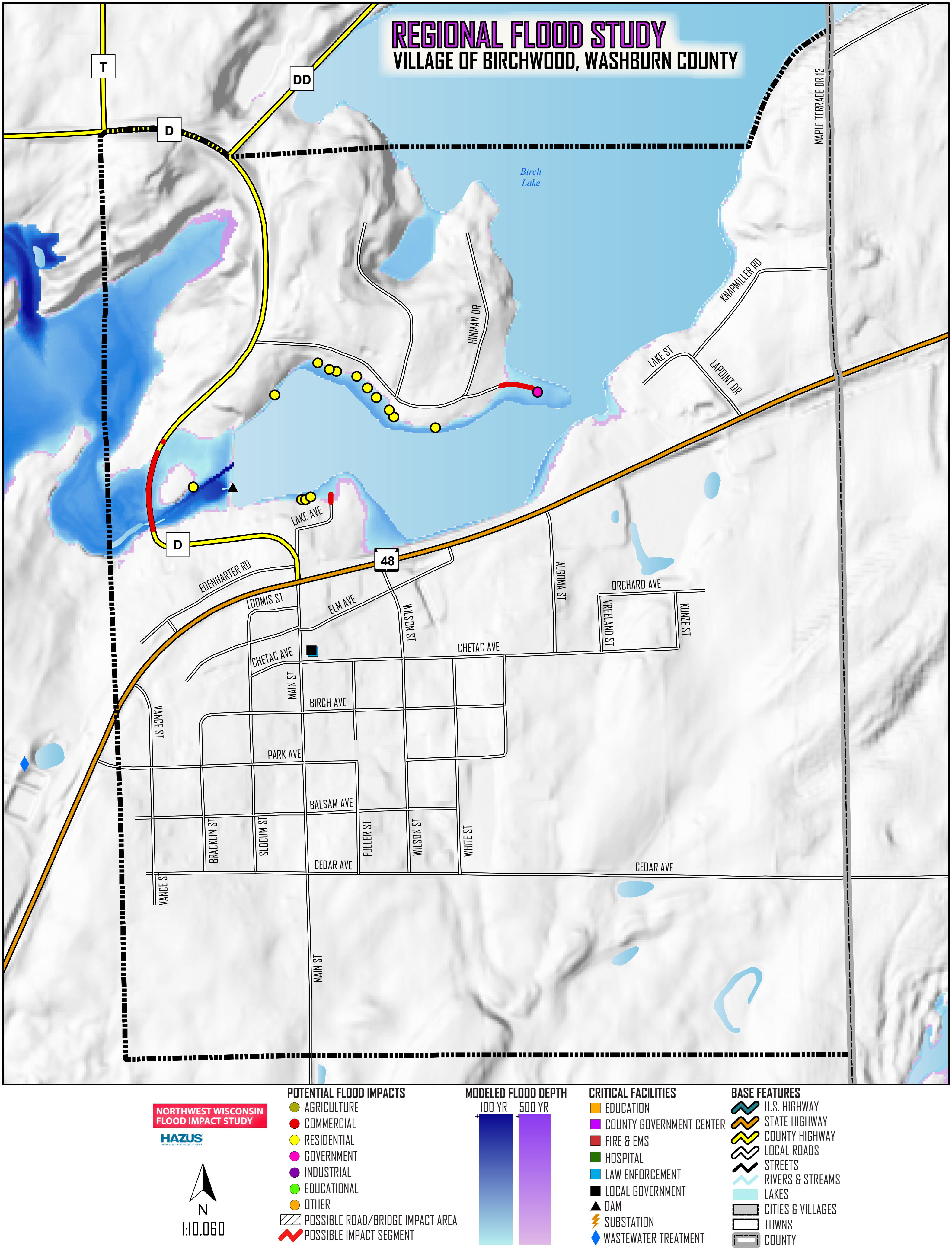
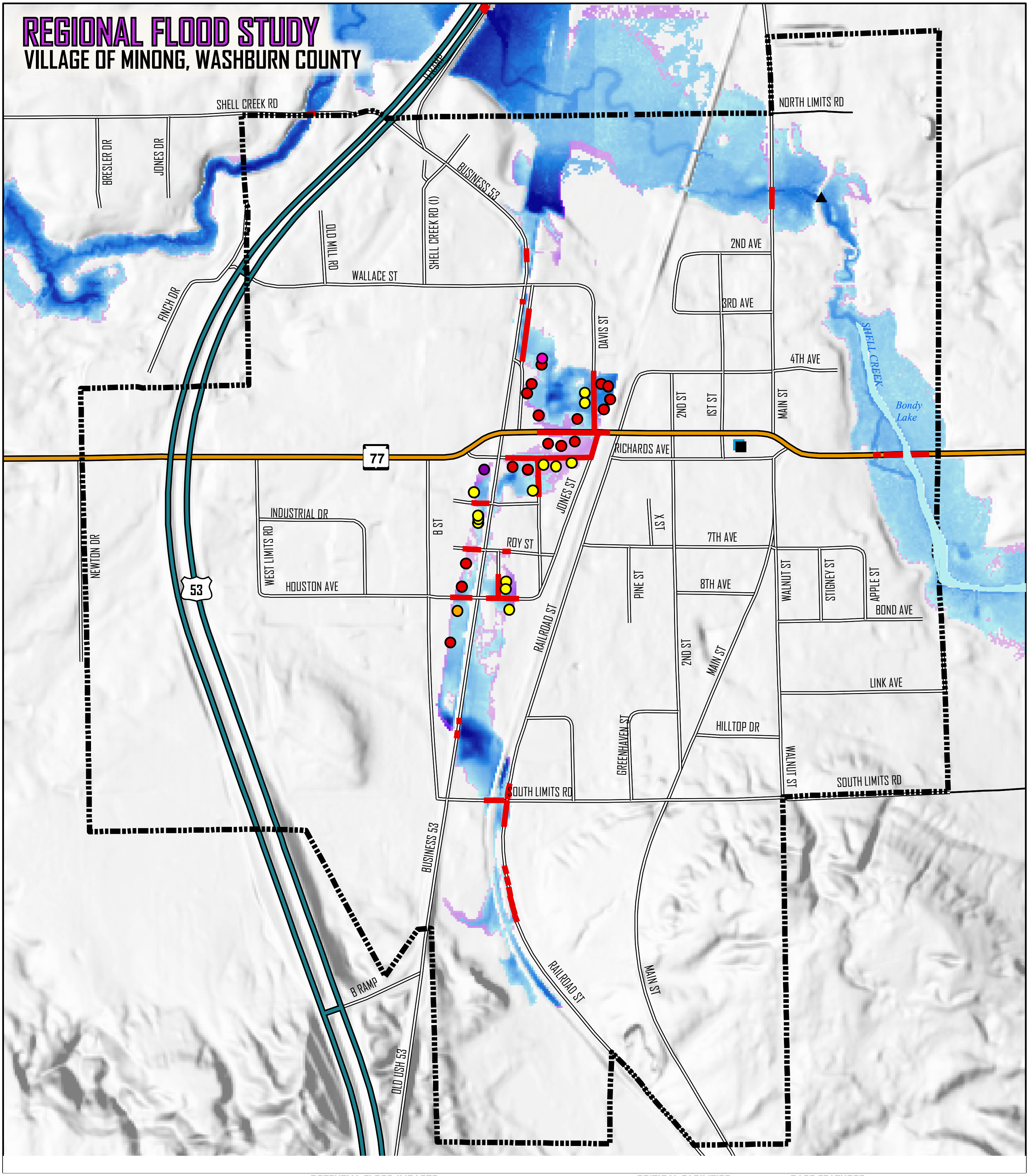
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY


REGIONAL FLOOD STUDY
VILLAGE OF BIRCHWOOD, WASHBURN COUNTY
T
DD
D
48
Birch Lake
MAPLE TERRACE DR 13
KNAPMILLER RD
LAKE ST
LAPOINT DR
HINMAN DR
LAKE AVE
EDENHARTER RD
LOOMIS ST
ELM AVE
WILSON ST
ALGOMA ST
ORCHARD AVE
VREELAND ST
KUNZE ST
CHETAC AVE
MAIN ST
BIRCH AVE
VANCE ST
PARK AVE
BALSAM AVE
BRACKLIN ST
SLOCUM ST
FULLER ST
WHITE ST
CEDAR AVE
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:10,060
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

REGIONAL FLOOD STUDY
VILLAGE OF MINONG, WASHBURN COUNTY



NORTHWEST WISCONSIN FLOOD IMPACT STUDY

HAZUS

N

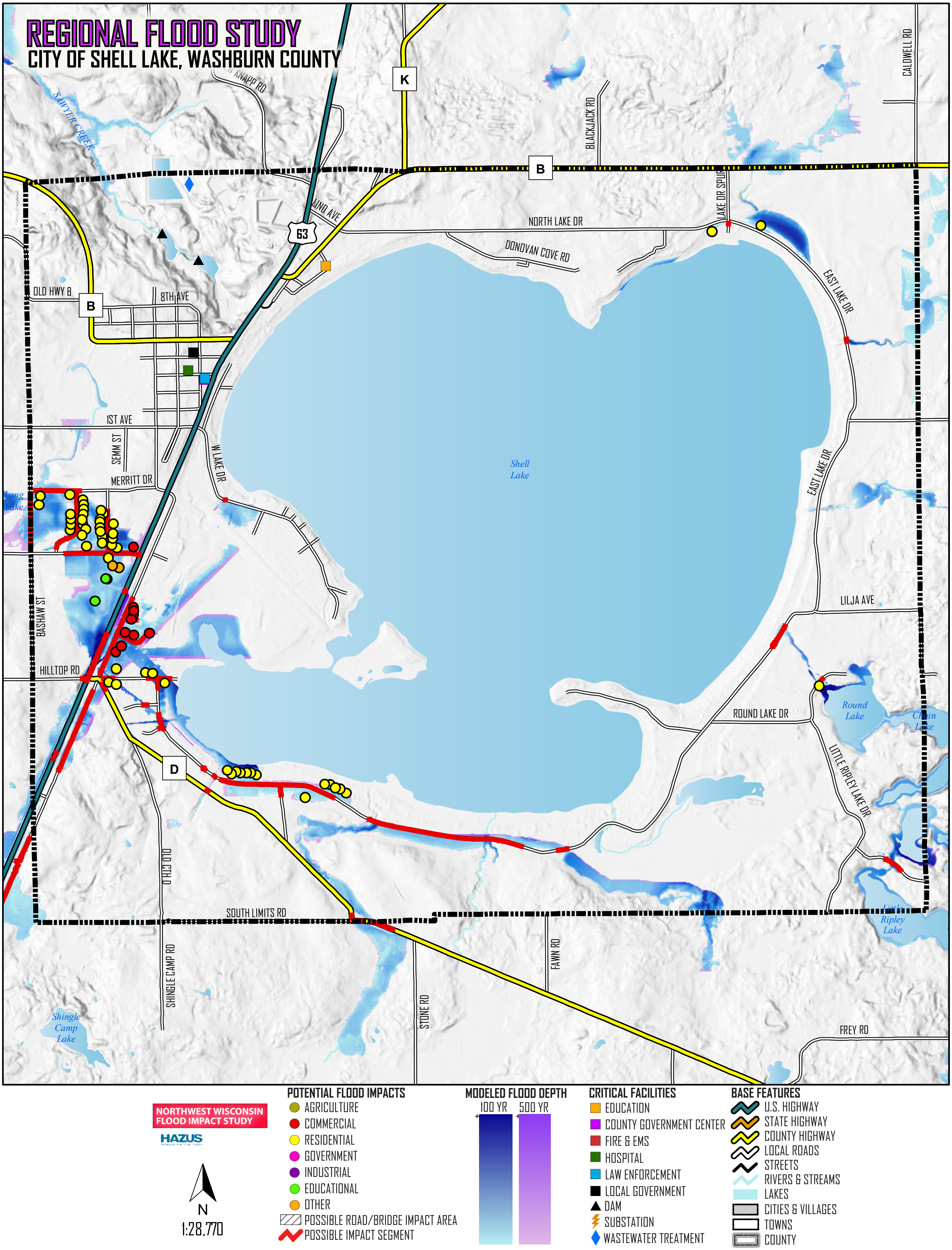
1:11,650

POTENTIAL FLOOD IMPACTS
- AGRICULTURE
- COMMERCIAL
- RESIDENTIAL
- GOVERNMENT
- INDUSTRIAL
- EDUCATIONAL
- OTHER
- POSSIBLE ROAD/BRIDGE IMPACT AREA
- POSSIBLE IMPACT SEGMENT

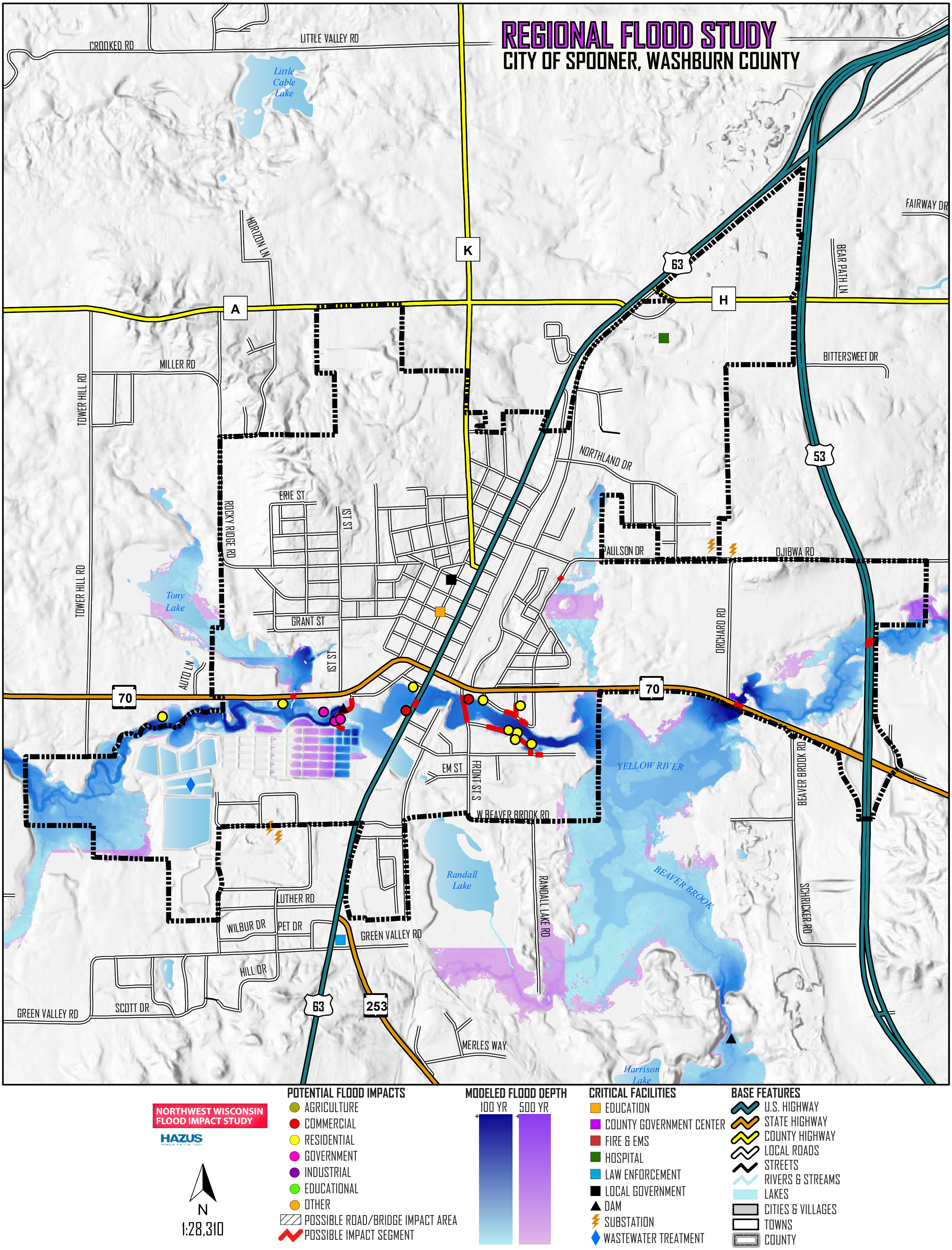
MODELED FLOOD DEPTH
100 YR | 500 YR

CRITICAL FACILITIES
- EDUCATION
- COUNTY GOVERNMENT CENTER
- FIRE & EMS
- HOSPITAL
- LAW ENFORCEMENT
- LOCAL GOVERNMENT
- DAM
- SUBSTATION
- WASTEWATER TREATMENT

BASE FEATURES
- U.S. HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- LOCAL ROADS
- STREETS
- RIVERS & STREAMS
- LAKES
- CITIES & VILLAGES
- TOWNS
- COUNTY



REGIONAL FLOOD STUDY
CITY OF SHELL LAKE, WASHBURN COUNTY
SAWYER CREEK
KNAPP RD
K
BLACKJACK RD
CALDWELL RD
B
LAKE DR SPUR
LIND AVE
63
NORTH LAKE DR
DONOVAN COVE RD
EAST LAKE DR
OLD HWY B
8TH AVE
1ST AVE
SEMM ST
MERRITT DR
W LAKE DR
Shell Lake
Long Lake
BASHAW ST
HILLTOP RD
LILJA AVE
ROUND LAKE DR
Round Lake
Chain Lake
LITTLE RIPLEY LAKE DR
Little Ripley Lake
D
OLD CTH D
SOUTH LIMITS RD
SHINGLE CAMP RD
Shingle Camp Lake
STONE RD
FAWN RD
FREY RD
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:28,770
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
EDUCATION
COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY



REGIONAL FLOOD STUDY
CITY OF SPOONER, WASHBURN COUNTY
CROOKED RD
LITTLE VALLEY RD
Little Cable Lake
HORIZON LN
FAIRWAY DR
BEAR PATH LN
K
A
H
63
MILLER RD
TOWER HILL RD
BITTERSWEET DR
NORTHLAND DR
53
ERIE ST
1ST ST
ROCKY RIDGE RD
PAULSON DR
OJIBWA RD
Tony Lake
GRANT ST
ORCHARD RD
AUTO LN
70
YELLOW RIVER
EM ST
FRONT ST S
W BEAVER BROOK RD
BEAVER BROOK RD
BEAVER BROOK
Randall Lake
RANDALL LAKE RD
SCHRICKER RD
LUTHER RD
WILBUR DR
PET DR
GREEN VALLEY RD
HILL DR
SCOTT DR
253
MERLES WAY
Harrison Lake
NORTHWEST WISCONSIN FLOOD IMPACT STUDY
HAZUS
N
1:28,310
POTENTIAL FLOOD IMPACTS
AGRICULTURE
COMMERCIAL
RESIDENTIAL
GOVERNMENT
INDUSTRIAL
EDUCATIONAL
OTHER
POSSIBLE ROAD/BRIDGE IMPACT AREA
POSSIBLE IMPACT SEGMENT
MODELED FLOOD DEPTH
100 YR
500 YR
CRITICAL FACILITIES
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COUNTY GOVERNMENT CENTER
FIRE & EMS
HOSPITAL
LAW ENFORCEMENT
LOCAL GOVERNMENT
DAM
SUBSTATION
WASTEWATER TREATMENT
BASE FEATURES
U.S. HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY
LOCAL ROADS
STREETS
RIVERS & STREAMS
LAKES
CITIES & VILLAGES
TOWNS
COUNTY

MITIGATION MECHANISMS

ECONOMIC IMPACT ON RURAL COMMUNITIES

A large part of the Northwest region of Wisconsin is currently classified as being rural. Wisconsin's rural areas account for much of the state's economic and social well-being. Although disproportionate to its population, rural areas provide natural resources that much of the state and country relies on for food, energy, water, forests, recreation, national character, and quality of life. Rural economics and the integrity of the community are intricately connected to these natural systems.

Very heavy precipitation events have intensified in recent decades in most U.S. regions and this trend is projected to continue. Projected changes in flood frequency based on climate projections and hydrologic models have recently begun to emerge and suggest that flood frequency and severity increases may occur in the Northeast and Midwest. Increasing heavy precipitation is an important contributing factor, but flood magnitude changes also depend on specific watershed conditions (including soil moisture, impervious area, and other human-caused alterations). Many rural communities are already facing considerable risk to their infrastructures, livelihoods, and quality of life from observed and projected changes in the climate. This climate volatility will progressively make the way of life harsher for many of those living in Northwest Wisconsin.

RURAL ECONOMIES

Rural communities are intricately tied to natural resources for their livelihoods and social structures. Major flooding due to increased precipitation is already currently affecting rural communities in Northwest Wisconsin. They will progressively increase over the years and will impact the abilities of rural economic activities (like forestry and recreation) to thrive.

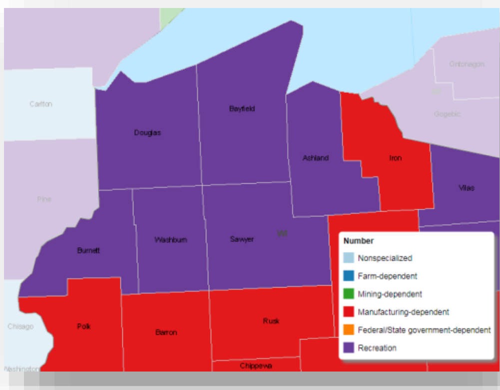
Rural communities are often characterized by their natural resources and associated economic activity. Dominant economic drivers include agriculture, forestry, energy, outdoor recreation, and tourism. In addition, many rural areas with appealing landscapes are increasingly reliant on second-home owners and retirees for their tax base and community activities. Changes in seasonality and intensity of precipitation will increase costs of runoff containment. Because many rural communities are less diverse than urban areas in their economic activities, changes in the viability of one traditional economic sector will place disproportionate stresses on community stability.

Businesses are often the center of small communities' economies, drawing in tourism dollars and ensuring a healthy community. The loss of any one business has disproportionate consequences to the community than being in a large urban area. Businesses accrue economic loss due to flooding through several reasons:

- Direct damage to business property (damage to facility, equipment, vehicles, inventory, etc.).
- Income loss due to closing a business for a period of time.
- Employees unable to report to work due to flooding.
- Income loss due to street closures limiting customer access.

- Income loss due to customers unable to access on or off-street parking.
- Lack of property insurance that covers floods or that includes disruption coverage.

Tourism is another significant contributor to rural economies. Changes in the length and timing of seasons, temperature, precipitation, and severe weather events can have a direct impact on tourism and recreation activities by influencing visitation patterns and tourism-related economic activity. All the counties in the study region have been highlighted as a county based on recreation except for Iron County which is highlighted as a manufacturing county. This indicates the immense role that tourism and recreation plays in these Northwest Wisconsin Counties.



Economic Dependence,
Source: USDA Economic Research Service 2013

Changing environmental conditions, such as wetland loss and increased risk of natural hazards such as wildfire, flash flooding, storm surge, river flooding, drought, and extremely high temperatures can alter the character and attraction of rural areas as tourist destinations.

Short-term downturns in regional tourism are often experienced after a flooding event. Although the impact on tourism infrastructure and the time needed to return to full operating capacity may be minimal, images of flood affected areas and assumptions of the state of recovery often lead to cancellations in bookings and a significant reduction in tourist numbers.

RESPONDING TO RISKS

Rural communities face particular geographic and demographic obstacles in responding to and preparing for flooding risks. In particular, physical isolation, limited economic diversity, and higher poverty rates, combined with an aging population, increase the vulnerability of rural communities. Systems of fundamental importance to rural populations are already stressed by remoteness and limited access.

Relatively rapid changes in demographics, economic activity, and climate are particularly challenging in rural communities, where local, agrarian values often run generations deep. Changing rural demographics, influenced by new immigration patterns, fluctuating economic conditions, and evolving community values add to these challenges – especially with regard to the impacts of flooding.

Modern rural populations are generally older, less affluent, and less educated than their urban counterparts. Rural areas are characterized by higher unemployment, more dependence on government transfer payments, less diversified economies, and fewer social and economic resources needed for resilience in the face of major changes. In particular, the combination of an aging population and poverty increases the vulnerability of rural communities to major flooding events.

There has been a trend away from manufacturing, resource extraction, and farming to amenity-

based economic activity in many rural areas of the United States. Expanding amenity-based economic activities in rural areas include recreation and leisure, e-commuting residents, tourism, and second home and retirement home development. This shift has stressed traditional cultural values and put pressure on infrastructure and natural amenities that draw people to rural areas. Changes in climate and weather are likely to increase these stresses. Rural components of transportation systems are particularly vulnerable to risks from flooding. Since rural areas often have fewer transportation options and fewer infrastructure redundancies, any disruptions in road, rail, or air transport will deeply affect rural communities.

Power and communication outages resulting from extreme events often take longer to repair in rural areas, contributing to the isolation and vulnerability of elderly residents who may not have cell phones. The lack of cellular coverage in some rural areas can create problems for emergency response during power failures.

Rural communities rely on various transportation modes, both for export and import of critical goods. Frequent flooding will result in increased erosion and maintenance costs for local road and rail systems, as well as changes in stream flows and predictability that will result in increased maintenance costs for waterways. Events that affect rail traffic would be particularly damaging to rural communities that depend upon these systems to get commodities to market.

Health and emergency response systems also face additional demands from substantial direct and indirect health risks associated with flooding events. Indirect risks, particularly those posed by emerging and reemerging infectious diseases, are more difficult to assess, but pose looming threats to economically challenged communities where health services are limited. Direct threats (such as storm events and coastal and riparian flooding) tend to be more associated with specific local vulnerabilities, so the risks are somewhat easier to assess.

The socioeconomic and demographic characteristics of rural areas interact with flooding to create health concerns that differ from those of urban and suburban communities. Older populations with lower income and educational levels in rural areas spend a larger portion of their income on health care than their urban counterparts. Moreover, health care access declines as geographic isolation increases. Overall, rural residents already have higher rates of age-adjusted mortality, disability, and chronic disease than do urban populations. These trends are likely to be exacerbated by flooding events.

Governments in rural areas are generally ill-prepared to respond quickly and effectively to large-scale events, although individuals and voluntary associations often show significant resilience. Health risks are exacerbated by limitations in the health service systems characteristic of rural areas, including the distance between rural residents and health care providers and the reduced availability of medical specialists.

The effects of flooding on mental health merit special consideration. Rural residents are already at a heightened risk from mental health issues because of the lack of access to mental health providers. The primary care physicians who form the backbone of rural health care often have heavy caseloads and lack specialized training in mental health issues. Additionally, patients referred to mental health specialists often experience significant delays.

The frequency and distribution of infectious diseases is also projected to increase with rising

temperatures and associated seasonal shifts. Increased rates of mutation and increased resistance to drugs and other treatments are already evident in the behavior of infectious disease-causing bacteria and viruses. In addition, changes in temperature, surface water, humidity, and precipitation affect the distribution and abundance of disease-carriers and intermediate hosts, and result in larger distributions for many parasites and diseases. Rural residents who spend significant time outdoors have an increased risk of exposure to these disease-carriers, like ticks and mosquitoes.

ADAPTATION

Responding to additional challenges from flooding impacts will require significant adaptation within rural transportation and infrastructure systems, as well as health and emergency response systems. Governments in rural communities have limited institutional capacity to respond to, plan for, and anticipate flooding impacts.

Extreme events (such as storms and floods) are expected to have widespread impacts on the provision of services from state, regional, local, and tribal governments. Emergency management, energy use and distribution systems, transportation and infrastructure planning, and public health will all be affected.

Rural governments often depend heavily on volunteers to meet community challenges like fire protection or flood response. In addition, rural communities have limited locally available financial resources to help deal with the effects of climate change. Small community size tends to make services expensive or available only by traveling some distance.

Local governance structures tend to de-emphasize planning capacity compared to urban areas. While 73% of metropolitan counties have land-use planners, only 29% of rural counties not adjacent to a metropolitan county have one or more planners. Moreover, rural communities are not equipped to deal with major infrastructure expenses. Even in communities where there is increasing awareness of flooding risks and interest in comprehensive adaptation planning, lack of funding, human resources, access to information, training, and expertise provide significant barriers for many rural communities.

If rural communities are to respond adequately to future flooding events, they will likely need help assessing their risks and vulnerabilities, prioritizing and coordinating projects, funding and allocating financial and human resources, and deploying information-sharing and decision support tools. There is still little systematic research on the vulnerability of rural communities and there is a need for additional empirical research in this area. Impacts due to flooding will cross community and regional lines, making solutions dependent upon meaningful participation of numerous stakeholders from federal, state, local, and tribal governments, science and academia, the private sector, non-profit organizations, and the general public.

Effective adaptation measures are closely tied to specific local conditions and needs and take into account existing social networks. The economic and social diversity of rural communities affects the ability of both individuals and communities to adapt to flooding, and underscores the need to assess flooding impacts on a local basis. The quality and availability of natural resources, legacies of past use, and changing industrial needs affect the economic, environmental, and social conditions of rural places and are critical factors to be assessed.

Successful adaptation to flooding requires balancing immediate needs with long-term development goals, as well as development of local-level capacities to deal with flooding.

Potential flood mitigation responses are likely to significantly affect rural communities, with both positive and negative effects. Decisions regarding adaptation responses for both urban and rural populations can occur at various scales (federal, state, local, tribal, private sector, and individual) but need to take interdependencies into account. Many decisions that significantly affect rural communities may not be under the control of local governments or rural residents. Given that timing is a critical aspect of adaptation, as well as mitigation, engaging rural residents early in decision processes about investments in public infrastructure, protection of shorelines, changes in insurance provision, or new management initiatives can influence individual behavior and choice in ways that enhance positive outcomes of adaptation and mitigation.

LOCAL RESPONSES TO FLOODING IN NORTHERN WI

When the July 11th, 2016 storm hit Northwest Wisconsin, it caused damage to multiple roads and streets, hampering work commutes and truck routes alike. The Wisconsin Department of Transportation and Ashland County had to create a new detour for car traffic that was about 40 miles longer than the normal route that connected the City of Ashland to the City of Mellen. After a couple of weeks, a shorter alternative route was created. However, it wasn't until several months later that the route between the two Cities was fully operational. This closure impacted thousands of motorists every day and had an unknown impact on the movement of goods through the region.

In the same storm that year, Saxon Harbor in Iron County experienced tremendous losses and damages to its harbor. Dozens of boats, trucks, and boat slips were damaged beyond repair. A county campground that brought in campers from around the state was destroyed as well. Business for Harbor Lights, a 40-year-old local restaurant, has been down 60% according to its owner. The harbor and campground are not expected to be fully running until the summer of 2019, nearly three years after the flooding event. The impacts of this flood have a significant economic impact for Iron County. Saxon Harbor earned $130,000 annually in revenue from camping and docking fees. Approaching close to three years of zero income represents a significant financial hit for Iron County that is home to about 5,700 people. Furthermore, the loss of around 2,000 people visiting the area on a summer weekend has had indirect economic consequences to the county.

Although damage to county, state, and federal roads have significant impacts on residents and industry, damage to forest roads can just as equally hamper and disable movement of lumber for the timber industry. This is especially prevalent in Northern Wisconsin where the timber industry makes up a large part of the economy. Making things even more difficult for the distribution of timber is that often time's overweight permits are suspended for truckers traveling through the region after a severe flood. Trucks can only haul 80,000 pounds and they often have longer detours than passenger vehicles. Great Lakes Timber Professionals Association Executive Director Henry Schienebeck said, "The suspension of permits is a good thing to preserve roads, but that means logging truck companies will be hauling less and making less money. Because mills don't keep a lot of wood on inventory, it is important to have a steady flow of wood being delivered. Hauling less wood means that it will take more

truckloads to generate the same amount of raw product to them." Therefore, depending on how long and which roads are closed for repairs, will determine whether the timber companies can keep up with demand.

The June 16th flood in 2018 that hit the region shut down numerous roads and caused millions of dollars in damages throughout the region. The popular U.S. Highway 2 route connecting the City of Superior with parts of Bayfield and Ashland County was damaged and caused it to be closed down for nearly three months during peak tourism season. This major route through northern Wisconsin averages 4,230 people driving east to west each day. The impacts of this flood have been felt by business owners. The owner of Solstice Outdoors in Ashland has stated that business has been down at least 90 percent. When the flood waters carry in clay sediments, it turns the bay red which in turn, discourages potential customers. Dave Sorenson, who runs Dave's Fishing Charters out of Bayfield, said he is doing about half as much business as a normal summer. Flooding has clear direct and indirect impacts on the economy in many ways. In the following figure, sales tax revenue can be seen over the past five years for the summer months (May-September) in the region. During this span of time, two severe floods impacted the area in July of 2016 and June of 2018. During the year 2016 when the region was impacted by flooding, four counties had lower sales tax revenue than the previous year when there was no major flood.

Table 18: COUNTY SALES TAX DISTRIBUTION (THOUSANDS $) – NORTHWEST REGION

	Ashland	Bayfield	Burnett	Douglas	Iron	Sawyer	Washburn
2018	620	528	506	1791	197	948	606
2017	611	503	478	1690	195	860	571
2016	544	466	437	1617	191	852	547
2015	535	491	440	1924	186	842	551
2014	511	469	412	1884	186	747	534

County Sales Tax Distributions ($000s) over the summer months from May-September from 2014-2018.
Source: WI Department of Revenue

Not only do washouts, closed stores, and road closures negatively impact businesses, but so does the spread of misinformation following a flooding event. Without relevant and updated information being advertised throughout the region, customers and their dollars will avoid traveling to the region due to unfound assumptions about the state of the region. Ensuring detours are posted as soon as safely is possible while also communicating that the town, city, or region is open for business can help from discouraging customers immediately after a flooding event.

MITIGATION MEASURES FOR CRITICAL FACILITES AND INFRASTRUCTURE

WASTEWATER TREATMENT FACILITIES (WWTF'S)

Wastewater systems collect domestic and industrial liquid waste products and convey them to treatment plants through collection and conveyance systems and pump (lift) stations. These facilities tend to be highly vulnerable to flooding due to the fact that they're generally sited in low lying areas adjacent to waterways. The release of untreated or partially treated sewage is relatively common during major flood events, posing a serous hazard to nearby waterways. The loss of power at wastewater treatment facilities or pumping (lift) stations may also cause a short or long-term disruption of services. Furthermore, floodwaters can inundate electrical equipment and controls at pump stations located wholly or partially below grade and/or in flood-prone areas. The conveyance system (pipeline network) is also vulnerable to flood inundation and flood-borne debris impact damage. Erosion can expose pipes resulting in fracturing and the inflow pressurization during a flood event can also damage pipelines.

MUNICIPAL WELLHEADS (HIGH CAPACITY WELLS)

A wellhead is the land area which contributes water to municipal wells. The zone of contribution (ZOC) of a well is where recharging precipitation enters a groundwater system and eventually flows to the well. Many communities have established wellhead protection areas (WHPA's) to protect the surface and subsurface area surrounding municipal wells. One of the greatest threats to a community's water supply is contamination, chemical, or biological flooding. Our analysis examined the proximity of estimated inundation areas in relation to the mapped wellhead protection area provided by the Wisconsin Department of Natural Resources and an estimated wellhead protection area of 1,200 radial feet. The 1,200-foot radius is the minimum wellhead protection area permitted by WDNR.

ELECTRICAL SUBSTATIONS

Electric substations and transmission lines were identified using digital data provided by the Wisconsin Public Service Commission (WPS) and verified using digital orthophotography and field survey. Inundation of a substation can result in an extended power disruption for a large number of customers. Restoring a flooded substation takes significantly longer than repairing a downed power line damaged by high winds or ice storms.

PIPELINES, PIPELINE PUMP STATIONS, & PIPELINE MAINTENANCE STATIONS

Pipelines in the project area were identified using the National Pipeline Mapping System, which contains information about hazardous liquid and gas transmission pipelines under the jurisdiction of U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA). The key concern relative to pipeline safety in the event of a flood is the integrity of the pipeline itself. Exposed lines are subject to sagging and leaking. Flood debris and the hydrodynamic stresses caused by floodwaters can also contribute to line failure and the release of contaminants into the environment.

LOCAL GOVERNMENT

The mapped locations of town halls within the project area. These facilities generally house most operations of the administrative functions of town government.

EDUCATIONAL INSTITUTIONS

The mapped locations of all educational institutions within the project area. Educational institutions are high-value facilities, which serve essential community functions.

FIRE AND EMS, HOSPITALS, & LAW ENFORCEMENT

The mapped locations of all fire departments and emergency medical services (EMS) facilities within the project area. These high-value assets are considered critical community services which would be essential to flood response and recovery.

HAZARDOUS MATERIALS SITES

Hazardous materials are those chemicals, reagents or substances that exhibit physical or health hazards, whether the materials are in a usable or waste state. Neither HAZUS-MH nor the DOGAMI script directly estimate damage caused by the release of hazardous materials, nor does either model estimate the probabilities of such a release occurring. The user can, however, overlay hazardous materials storage locations and the flood depth grid to identify those areas where hazardous materials sites may be exposed to flooding. Hazardous materials storage site data for the project area were obtained from Wisconsin Emergency Management. This information is collected under the federal Emergency Planning and Community Right-to-Know Act (EPCRA). The database for the project area contains records for 527 hazardous materials storage sites, mostly located within cities and villages. Where only a physical address was provided, records were manually geocoded to determine the likely physical location of the identified facility. Given the imprecise nature of the methodology, this analysis should only be considered as a general guide.

DAMS/LEVEES

Dams are included in the utilities assessment as a cartographic input only. HAZUS – MH/DOGAMI do not provide an analysis option for the dam failure hazard.

CRITICAL FACILITES AND INFRASTRUCTURE FLOOD ASSESSMENT

Utility	Description	Potential Impacts	
		100-YR	500-YR
Wastewater Treatment Facilities	Flood events can cause extensive damage to wastewater infrastructure. ▪ Infrastructure damage, possibly resulting in service interruptions ▪ Pipe breaks due to washouts, which could result in sewage spills or low water pressure throughout the service area ▪ Debris blockage at an intake or unearthed water and wastewater lines due to falling trees ▪ Loss of power and communication lines ▪ Combined sewer overflows (CSOs) ▪ Water quality changes to source waters and treated effluents, including increased turbidity, increased nutrients and other potential contaminants ▪ Restricted access to the facility due to debris, flood waters and damage to roadways from washouts and sinkholes ▪ Loss of water quality testing capability due to restricted facility and laboratory access and damage to utility equipment	Port Wing Wastewater Treatment Facility Mellen Wastewater Treatment Facility Butternut Wastewater Treatment Facility Webster Wastewater Treatment Facility Solon Springs Wastewater Treatment Facility Bad River Water/Wastewater Treatment Facility	Port Wing Wastewater Treatment Facility Mellen Wastewater Treatment Facility Butternut Wastewater Treatment Facility Webster Wastewater Treatment Facility Solon Springs Wastewater Treatment Facility Bad River Water/Wastewater Treatment Facility
Municipal Wellheads (High Capacity Wells- within the potential flooding scenario)	High capacity wells provide the primary water supply to communities and businesses in Municipalities throughout the region. Flooding can cause elevated bacteria and/or pollutants in well water.	15 Municipal Wellheads	15 Municipal Wellheads
Municipal Wellheads (High Capacity Wells- within 1,200 feet of a potential flooding scenario)	High capacity wells provide the primary water supply to communities and businesses in Municipalities throughout the region. Flooding can cause elevated bacteria and/or pollutants in well water.	167 Municipal Wellheads	170 Municipal Wellheads
Electrical Substations	Electric substations are critical to the functionality of the electric grid. Their transformers boost the voltage to very high levels which enables efficient transmission across long distances. Substations which are located in flood prone areas potentially put the electrical grid at risk.	Town of Trego (1 substation) Town of White River (1 substation) City of Hayward (1 substation) Village of Butternut (1 substation)	Town of Trego (1 substation) Town of White River (2 substations) City of Hayward (2 substations) Village of Butternut (1 substation) Town of Bell (1 substation)

Utility	Description	Potential Impacts	
		100-YR	500-YR
Pipelines	During floods, the extreme forces of the floodwaters, floating debris, natural erosion and water pressure from high water can adversely affect pipelines. Flood waters may also change the landscape, exposing pipelines and increasing vulnerability to damage. Enbridge Pipelines Inc. operates the Lakehead System pipeline that enters Douglas County in the Town of Superior and extends east through, Bayfield, Ashland and Iron County. It also extends southward through Ashland County and into Clark County. This line is used to transport oil and petroleum related products from Canada to the U.S. Northern Natural Gas operates a natural gas pipeline that extends form Rib Lake northwesterly into Price County.	Town of Superior (8 Crossings) Town of Parkland (3 Crossing) Town of Oakland (10 Crossings) Town of Amnicon (7 Crossings) Village of Poplar (4 Crossings) Town of Maple (2 Crossings) Town of Brule (2 Crossings) Town of Oulu (1 Crossing) Town of Hughes (2 Crossings) Town of Trip (2 Crossings) Town of Iron River (2 Crossings) Town of Barksdale (3 Crossings) Town of Pilsen (2 Crossings) Town of Eileen (7 Crossings) City of Washburn (1 Crossing) Town of Bayview (2 Crossings) Town of Bayfield (1 Crossing) Town of Gingles (6 Crossings) Town of Sanborn (5 Crossings) Town of Morse (3 Crossings) City of Mellen (1 Crossing) Town of Gordon (2 Crossings) Town of Jacobs (1 Crossing) Town of Peeksville (3 Crossings) Village of Butternut (1 Crossing) Town of Saxon (2 Crossings) Town of Kimball (5 Crossings) City of Montreal (1 Crossing) City of Hurley (1 Crossing) Village of Grantsburg (3 Crossings) Town of Solon Springs (2 Crossings) Town of Gordon (2 Crossings) Town of Wascott (1 Crossing) Town of Frog Creek (1 Crossing) Town of Stinnett (4 Crossings) Town of Bass Lake (1 Crossing) Town of Sand Lake (2 Crossings)	Town of Superior (8 Crossings) Town of Parkland (3 Crossing) Town of Oakland (10 Crossings) Town of Amnicon (7 Crossings) Village of Poplar (2 Crossings) Town of Maple (2 Crossings) Town of Brule (2 Crossings) Town of Oulu (1 Crossing) Town of Hughes (2 Crossings) Town of Trip (2 Crossings) Town of Iron River (2 Crossings) Town of Barksdale (3 Crossings) Town of Pilsen (2 Crossings) Town of Eileen (7 Crossings) City of Washburn (1 Crossing) Town of Bayview (2 Crossings) Town of Bayfield (1 Crossing) Town of Gingles (6 Crossings) Town of Sanborn (5 Crossings) Town of Morse (3 Crossings) City of Mellen (1 Crossing) Town of Gordon (2 Crossings) Town of Jacobs (1 Crossing) Town of Peeksville (3 Crossings) Village of Butternut (1 Crossing) Town of Saxon (2 Crossings) Town of Kimball (5 Crossings) City of Montreal (1 Crossing) Village of Grantsburg (3 Crossings) Town of Solon Springs (3 Crossings) Town of Gordon (2 Crossings) Town of Wascott (1 Crossings) Town of Frog Creek (1 Crossing) Town of Stinnett (4 Crossings) Town of Bass Lake (2 Crossings) Town of Sand Lake (2 Crossings)
Local Government	In the event of a flood, town halls can often serve as the headquarters for relief operations. Having a place where information and decisions are disseminated is vital to the resiliency of the community during a flooding event.	Village of Butternut Town Hall Town of Crystal Town Hall	Village of Butternut Town Hall Town of Crystal Town Hall Town of Jacobs Town Hall

Utility	Description	Potential Impacts	
		100-YR	500-YR
Schools	Damaged or flooded schools can disrupt life for entire communities exposing students to potentially life-threatening situations and makes property vulnerable to serious damage or destruction.	None	None
Fire or EMS	Emergency response services are critical to providing for the wellbeing of its residents in times of a flooding event. Being compromised in any way can impact the safety of those in need. Ensuring that these facilities response time won't be slowed will potentially save lives during a flooding event.	None	None
Hospitals	Without a fully functioning hospital, the lives of its residents will be at risk. Flood waters can damage essential equipment, knock out power, or slow medical treatment for its patients. Other direct damages can include losses in infrastructures, lifeline installations, and medical supplies. Indirect costs are unforeseen expense after emergencies such as increased risk of outbreaks due to loss of laboratory or diagnostic support.	None	None
Law Enforcement	The law enforcement's job it to provide a safe environment for people's lives and property during the event of a flood. Looting, crime, and flooded roads create a challenging situation for law enforcement. Flooded police stations will hurt the ability for law enforcement to protect and serve.	None	None
Hazardous Waste	Animal waste, coal ash, toxic chemicals, and untreated human sewage are of great concern to communities facing flooding. Flood waters can spread the pollution that can impact people's health, drinking water, or wellbeing of their property. Each village or town is exposed to hazardous materials traveling on their streets or to industrial installations that could endanger the surrounding populations if they malfunction.	City of Hayward (Auto Waste) Town of Daniels (Auto Waste) Village of Butternut (Manufacturing Waste)	City of Hayward (Auto Waste) Town of Daniels (Auto Waste) Village of Butternut (Manufacturing Waste)

Utility	Description	Potential Impacts	
		100-YR	500-YR
Pipeline Pump/ Maintenance Stations	Flooding can severely hamper the ability of a pump station to operate normally. The loss of even just one pipeline pump station can disrupt distribution patters as well as put the surrounding environment at risk. Equally as vital is the smooth operation of maintenance stations that keep the pipeline running free of problems. When access is limited or equipment is damaged by flooding, it endangers the integrity of the pipeline.	None	None
Dams/Levees	Dams and levees are artificial barriers constructed across waterways for purposes of water control, storage or diversion. Floods resulting from dam/levee failure are usually associated with heavy precipitation, runoff from snowmelt, or flood conditions. The area immediately below the dam is at greatest risk, as flood discharges decrease as the flood wave moves downstream. Dam or levee failure could result from poor design or construction, operational mistakes and oversights, or the magnitude of floodwaters could simply exceed the design capacity of the structure. Dam or levee failures pose serve threats to life and property in downstream areas. These structures can fail with little or no advance warning.	176 Dams Insufficient data to perform analysis (Dam Failure)	176 Dams Insufficient data to perform analysis (Dam Failure)

Table 19: CRITICAL FACILITIES/INFRASTRUCTURE/HAZARDOUS MATERIALS STORAGE SITE IMPACTS: 100-YEAR FLOOD LOSSES - REGION

County	Critical Facilities	Infrastructure (count of intersections with flood depth grid)	Hazardous Materials Storage Sites
Ashland	4	56	3
Bayfield	1	75	1
Burnett	1	66	0
Douglas	1	71	0
Iron	0	20	0
Sawyer	0	64	1
Washburn	1	70	0
Grand Total	**8**	**422**	**5**

Table 20: CRITICAL FACILITIES/INFRASTRUCTURE/HAZARDOUS MATERIALS STORAGE SITE IMPACTS: 500-YEAR FLOOD LOSSES - REGION

County	Critical Facilities	Infrastructure (count of intersections with flood depth grid)	Hazardous Materials Storage Sites
Ashland	6	55	3
Bayfield	1	77	1
Burnett	1	68	0
Douglas	1	68	0
Iron	0	21	0
Sawyer	0	56	1
Washburn	1	74	0
Grand Total	**10**	**419**	**5**

MODELED IMPACTS TO LOCAL ROADWAYS

Table 21: Regionwide Potential Roadway Impacts, 100-year Flood Scenario (miles)

Road Type	Ashland	Bayfield	Burnett	Douglas	Iron	Sawyer	Washburn	**Region**
US. Highway	0.2	1.0	0.0	0.7	0.7	0.9	1.4	**4.8**
State Highway	2.0	2.1	2.1	0.8	0.2	4.3	0.3	**11.7**
County Highway	2.8	2.9	5.1	3.9	1.1	3.2	3.6	**22.7**
Town Road	26.3	40.0	26.3	22.9	6.7	29.7	24.5	**176.3**
Street	0.1	0.4	3.5	2.0	0.7	0.4	0.1	**7.1**
Forest Road	0.0	0.6	0.1	0.4	0.7	0.0	2.9	**4.7**
Total	**31.3**	**46.9**	**37.0**	**30.6**	**10.1**	**38.6**	**32.8**	**227.3**

Table 22: Regionwide Potential Roadway Impacts, 500-year Flood Scenario (miles)

Road Type	Ashland	Bayfield	Burnett	Douglas	Iron	Sawyer	Washburn	**Region**
US. Highway	0.2	1.1	0.0	1.6	0.3	1.5	2.0	**6.6**
State Highway	2.2	1.6	2.6	0.7	0.5	6.6	0.5	**14.8**
County Highway	3.3	3.7	5.9	4.7	1.5	4.1	4.6	**27.8**
Town Road	27.9	47.6	30.2	28.3	8.1	36.8	29.0	**207.7**
Street	0.1	0.6	3.8	2.5	0.7	0.6	0.1	**8.4**
Forest Road	0.0	0.6	0.7	0.4	1.7	0.0	3.4	**6.7**
Total	**33.7**	**55.2**	**43.2**	**38.2**	**12.6**	**49.6**	**39.6**	**272.0**

The analysis of potentially impacted roadways found that 227.3 miles of roadway would be impacted by the 100-year scenario and 272.0 miles of roadway under the 500-year

scenario throughout the region. In both flood scenarios, town roads accrued the highest number of potential miles of roadway impacted over all other road types. They accounted for approximately 78 percent of the potentially impacted roadways in a 100-year flood and 76 percent of roadways in a 500-year flood scenario. Bayfield County had the greatest number of potentially impacted miles of roadway in both flood scenarios. In a 100-year flood scenario, Bayfield County would potentially face 46.9 miles of impacted roadways while in a 500-year flood scenario, they could expect 55.2 miles of roadway to be possibly impacted. All counties in the study region had higher number of estimated damaged miles of roadway in a 500-year flood scenario than a 100-year flood scenario.

STRATEGIES FOR PREPARING FOR RESILIENCY

Natural disasters and their effects will continue to impact Northwest Wisconsin and the local economy. How we respond to these occurrences, or more importantly how we change the landscape must be examined to include a review of existing infrastructure, housing, commercial buildings, and local government facilities to determine potential impact from disaster and what recovery options exist.

Flooding can impact a wide area by inundating buildings and damaging infrastructure. Our economy needs to be resilient in the face of natural disasters. Resiliency is tied to a community and region being able to minimize future risks. Community leaders must engage in identification and assessment of risks that could impede economic activity after a disaster that could result in temporary or even permanent business closures. Aquifer storage and recovery, floodplain and stream restoration, flood diversion and storage, or green infrastructure methods may support communities in reducing the risks associated with the impacts of flood and drought conditions.

The HAZUS analysis has identified impacts to infrastructure, housing, commercial buildings, and local government facilities based on flooding scenarios. County and local community recognition of these impacts is important to implement strategies for future improvements and disaster planning measures. Significant flooding of the transportation network has been identified throughout the county that will negatively impact economic stability during floods. Preparing for future flood events is necessary to protect the economic viability of local business and employment of area residents. While several approaches to resiliency and flood recovery will be necessary, taking steps to incorporate future actions can speed recovery when floods occur and prevent potential flood damage. There are several ways that buildings can be damaged during flooding. These risks include water damage, hydrostatic pressure exerted by water and saturated soils, hydrodynamic pressure caused by moving water, and damage from large objects and debris propelled by water and wind during a storm. Retrofitting existing buildings can help minimize the damage caused during flooding events. Particular care should be taken when considering the impacts of climate change on vulnerable populations. As cited by Boston's Chief Resilience Officer, Dr. Atyia Martin, vulnerable populations can include children, the elderly, the sick, the disabled, renters, low-income communities, minority residents, those with less than a high school education, and those with limited English proficiency.

FEDERAL PROGRAMS THAT CAN PROVIDE ASSISTANCE PRIOR TO A FLOOD

To accommodate flood water during storm events and in order to reduce the risk that homes, businesses, and critical infrastructure will be damaged, communities can acquire or protect land in flood-prone locations. Communities can partner with private property owners and conservation organizations such as land trusts or other organizations to purchase land outright or acquire conservation easements on undeveloped properties along a riparian corridor. These tools ensure that the land remains in an undeveloped state and retains its ability to accommodate floodwater. Eligible communities may also work with FEMA and Wisconsin Emergency Management to identify properties that have been repeatedly flooded, and when funding is available, coordinate buyouts of those properties through FEMA grant programs. FEMA administers three grant programs to assist communities in mitigating the effects of natural hazards: the Flood Mitigation Assistance (FMA) Program, the Hazard Mitigation Grant

Program (HMGP), and the Pre-Disaster Mitigation (PDM) grant program. State, Tribal, and local government agencies may apply through the States to receive funds for these programs. FEMA requires these applicants to meet a specific set of requirements when applying for the funds to ensure that proposed projects meet the program requirements, Federal environmental laws and regulations, and cost-effectiveness requirements. FEMA Flood Mitigation Assistance (FMA) Program grants help with planning and performing projects to reduce future flood losses. These may include lifting, buying, or moving National Flood Insurance Program (NFIP)-insured structures. FMA provides funds yearly to reduce or remove risk of flood damage to NFIP insured buildings.

FEMA MITIGATION GRANT PROGRAMS

Program	Flood Mitigation Assistance Program (FMA)	Hazard Mitigation Grant Program (HMGP)	Pre-Disaster Mitigation Grant Program (PDM)
At a Glance	FEMA Flood Mitigation Assistance Program grants help with planning and performing projects to reduce future flood losses. These may include lifting, buying or moving National Flood Insurance Program (NFIP)-insured structures. FMA provides funds yearly to reduce or remove risk of flood damage to NFIP insured buildings.	FEMA gives Hazard Mitigation Grant Program funding to states to perform long-term hazard reduction after a major disaster. The purpose is to reduce the loss of life and property due to natural disasters. HMGP funds also support reduction and removal of hazards during the immediate recovery from a disaster. Section 404 of the Stafford Act authorizes the program. Funds are for projects to reduce or prevent loss from future disasters. Projects must provide a long-term solution to a problem. One example is lifting a home to reduce the risk of flood damage instead of using sandbags and pumps to fight the flood. Potential savings must be more than the cost of the project. Funds can help protect public or private property.	FEMA provides Pre-Disaster Mitigation Program grants to help plan and direct hazard mitigation projects before a disaster. Funding these plans and projects reduces overall risk to the population and structures. Funded projects also reduce the need for federal funding in actual disasters. FEMA gives funding to states, territories and tribes in line with applicable law and current budget. PDM grants are competitive.

Program	Flood Mitigation Assistance Program (FMA)	Hazard Mitigation Grant Program (HMGP)	Pre-Disaster Mitigation Grant Program (PDM)
Eligible Applicants	State, territorial, and tribal governments, and certain non- profits may apply. Individual homeowners and businesses may not apply but a community may apply on their behalf.	Hazard Mitigation Grant Program funds are available only within a presidentially declared disaster area. State, territorial and tribal governments and certain non-profits may apply. Homeowners and businesses may not apply but a community may apply on their behalf.	State, territorial and tribal governments and certain non-profits may apply. Homeowners and businesses may not apply but a community may apply on their behalf.
Eligible Activities	The FMA allows buying property, destroying, moving or lifting structures. It also allows dry flood proofing of non-residential structures, small local flood reduction projects, and plans to prevent flood damage. Projects must have the effect of reducing the risk of flood to NFIP insured property, buildings, and structures.	A state governor asks for help in a presidentially declared disaster. HMGP funds are available within the declared disaster area. Utility projects must meet the following criteria: • Conform to the State's Hazard Mitigation Plan. • Benefit the disaster area. • Meet all environmental requirements. • Solve a problem. • Be cost-effective.	The PDM allows buying property and destroying, moving or lifting structures. It also allows dry flood proofing of non-residential structures, small local flood reduction projects and remodeling of existing buildings and facilities. Other types of projects allowed are safe room construction, infrastructure retrofit, soil stabilization, and hazard mitigation planning.
Cost Sharing	Federal: up to 75 percent. Non-federal: 25 percent. Repeat and severe repeat loss properties may be eligible for Federal cost share: up to 100 percent.	Federal: 75 percent. Non-federal: 25 percent. Non-federal matches can mix cash and in-kind sources (for example labor or materials). The non-federal cost share usually cannot include other federal funds.	Federal: up to 75 percent. Non-federal: 25 percent. "Small and impoverished communities" as defined in Section 203 of the Stafford Act may receive 90 percent federal share.

Program	Flood Mitigation Assistance Program (FMA)	Hazard Mitigation Grant Program (HMGP)	Pre-Disaster Mitigation Grant Program (PDM)
Applications	States have primary responsibility for selecting and directing mitigation activities. Funds for the FMA program are limited. The state point of contact for the FMA program is the WI Hazard Mitigation Officer.	Contact your local government to apply for an HMGP grant. Local governments should contact the WI Hazard Mitigation Officer. The state selects eligible projects and sends them to the FEMA Regional Office for review. The time required for review depends on the complexity of the project. The state selects eligible projects and sends them to the FEMA Regional Office where they are reviewed for compliance with Federal laws and regulations. The time required for review depends on the complexity of the project.	States are responsible for selecting and directing mitigation activities. Funds for the PDM program are limited. The state point of contact for the PDM program is the WI Hazard Mitigation Officer.

In most cases, the best thing a homeowner can do to reduce their premiums on flood insurance while mitigating the most flood damage, would be to elevate their structure above the base flood elevation (BFE). Structural elevation oftentimes is not feasible based on various building characteristics. Characteristics may include: townhomes, connected row houses; older homes; mid-rise multi-family buildings, etc. It should also be noted that the one and only method that will prevent any future flooding damage is to move the house to a safe location that is out of the flood plain. This is costly and time consuming, but it will ensure the best results. Because this is difficult for most homeowners to achieve, a variety of other mitigation techniques will be described to reduce flooding damage to one's home.

It is critical that the homeowners follow all the rules and regulations when applying these changes to their home. This may require hiring a qualified contractor, obtaining building permits, or even the need for an elevation or engineering certificate.

INTERIOR MODIFICATION/ RETROFIT MEASURES

BASEMENT INFILL

This mitigation technique fills a basement that is below the BFE, up to grade (ground level) with compacted soil or pea gravel. Parts of the basement wall that are not completely covered by fill, will have to have flood openings installed to allow automatic entry and/or exit of flood waters. Any utilities in the basement must be elevated or waterproofed to protect them from damage or loss of function from flooding. This technique has been proven to be effective at reducing damage to the building and its contents. It is critical to ensure the flood openings are routinely maintained so that they will open in a flooding event. This method will lead to a decrease in square footage and of possible living or rental space. Basement infill is a relatively high-cost measure that has an expected life span of 30 to 50 years. Flood insurance premiums could be lowered based on how high the raised height of the lowest floor is. It should be noted that this method is restricted to areas that will experience low flood depths at low velocities.

ABANDON LOWEST FLOOR

This method requires the homeowner to vacate the lowest floor of a two-floor building. Flood openings will have to be installed to allow automatic entry and/or exit of flood waters. Any utilities in the basement must be elevated to protect them from damage or loss of function from flooding. This technique has been proven to be effective at reducing damage to the building and its contents. It is critical to ensure the flood openings are routinely maintained so that they will open in a flooding event. This technique will lead to a decrease in square footage and of possible living or rental space. Abandoning the lowest floor is a relatively high-cost measure that has an expected life span of 30 to 50 years. Flood insurance premiums could be lowered based on the new lowest floor living level.

ELEVATE LOWEST INTERIOR FLOOR

This measure elevates the lowest interior floor of a residential building. This usually can only be done in buildings with high ceilings. Any sections below the lowest elevated interior floor walls have to be either filled to create a stem wall or retrofitted with flood openings that allows automatic entry and/or exit of floodwaters. Any utilities in the basement must be elevated to protect them from damage or loss of function from flooding. Raising the lowest floor of buildings has been proven to be effective at reducing damage to the building and its contents.

Home at the end of a block of several elevated homes across street from Darlington's new ball fields. Lots and homes all are raised above the Base Flood Elevation for this neighborhood and were not flooded during the June 2008 flood. **Photo:** Barbara Ellis, FEMA

It is critical to ensure the flood openings are routinely maintained so that they will open in a flooding event. This technique can lead to a decrease in square footage and of possible living or rental space.

Elevating the lowest interior floor is a relatively high-cost measure that has an expected life span of 30 to 50 years. Flood insurance premiums could be lowered based on the new lowest floor living level.

WET FLOODPROOFING MEASURES

FLOOD OPENINGS

This technique involves installing openings in foundation, enclosure walls, or garage doors that are below the BFE that allow automatic entry and exit of floodwaters to prevent collapse from the immense pressure created from standing water. Flood openings have been proven to be effective at reducing structural damage to buildings. It is critical to ensure the flood openings are routinely maintained so that they will open in a flooding event. Installing flood openings is a relatively low-cost measure that has an expected life span of 15-20 years. Flood insurance premiums could be lowered if the lowest floor is rated at a higher elevation.

The dwelling depicted below sustained flood damage during Hurricane Sandy in 2012. The homeowner undertook measures to make the dwelling more flood resistant in the future. The structure was retrofitted using some of the techniques featured in this publication. These

Photo source: FEMA P-1037, inside cover photo, image courtesy FEMA

techniques include elevating utilities, basement infill, and installation of flood openings. These combined measures will serve to make the dwelling much more flood resistant and have the added benefit of reducing flood insurance premiums

ELEVATE BUILDING UTILITIES

This method moves all building utility systems and associated equipment (e.g., furnaces, septic tanks, and electric and gas meters) to protect utilities from damage or from loss of function during a flood. Building utility systems can be raised using elevated pedestals, moving equipment to higher floors, and by building an elevated utility room. Elevation of building utilities has been proven to be effective at reducing or eliminating utility damage during a flood.

The elevation of building utility systems may expose them to damage from other natural hazards, such as high winds and earthquakes. This method is a relatively moderate-cost measure that has an expected life span of 15 to 20 years. Discounts are currently available for elevating building utilities based on where they are relocated or anchored down.

FLOODPROOF BUILDING UTILITIES

This measure floodproofs all building utility systems and associated equipment to protect it from damage or loss of function from flooding. Some techniques include placing outdoor equipment behind flow walls or placing indoor equipment behind a wall or in a watertight, passive utility enclose. This system is subject to restriction related to flood conditions (three-foot maximum flood depth, low velocity, short duration) and building conditions. Floodproofing building utilities can be effective at reducing or preventing utility damage during a flood. It is critical to ensure the floodproofing systems are routinely maintained so that they will close during a flooding event. Floodproofing residential building utility systems is a relatively moderate-to-high-cost measure that has an expected life span of 15 to 20 years. There are currently no discounts or decreases in premiums under the current program.

Elevated electrical panel at the Pecatonica River Trails Campground (Darlington, WI) **Photo courtesy:** WDNR, Michelle Staff

FLOOD DAMAGE-RESISTANT MATERIALS

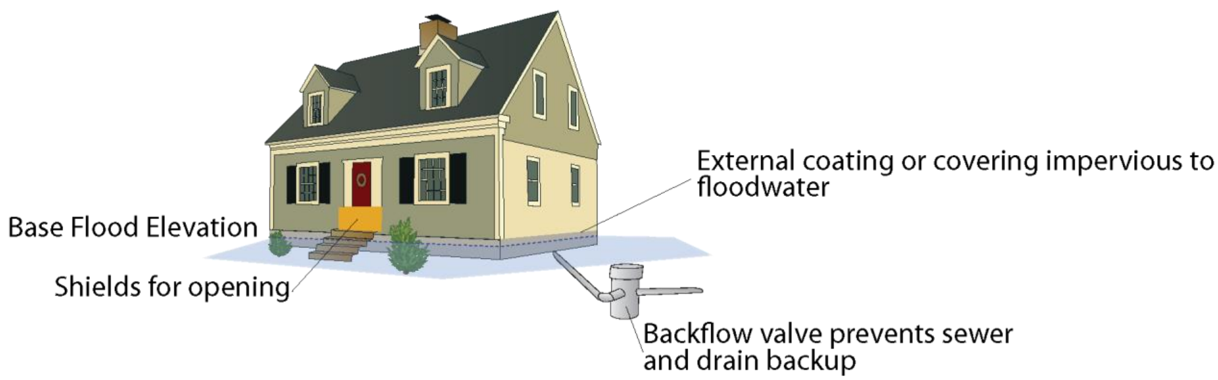
This mitigation technique involves the installation of flood damage-resistant materials such as non-paper-faced gypsum board and terrazzo tile flooring for building materials and furnishing below the BFE to reduce damages accrued from flooding events. Flood damage-resistant materials have been proven to be effective at mitigating non-structural damage to buildings in a low-velocity flood. It is critical to use materials and assemblies that meet FEMA requirements.

The use of flood damage-resistant materials is a relatively moderate-cost measure that has an expected life span of 10 to 20 years. There are currently no discounts or decreases in premiums under the current program.

DRY FLOODPROOFING MEASURES

PASSIVE DRY FLOODPROOFING SYSTEM

This method involves coating or covering the home to protect it against flood waters. The materials must be impervious to floodwater and certified and constructed to a maximum of three feet above ground level. Dry floodproofing can be an effective way of reducing or eliminating building and contents damage during a flood. Homeowners may need to reinforce walls and floor slabs to withstand the immense pressure the flood waters will create. This setup would also require the installation of a drainage and back-up emergency power system. The use of a dry floodproofing system is a relatively high-cost measure that has an expected life span of 15 to 30 years with extensive annual maintenance costs and is usually reserved for historic sites. There are currently no discounts or decreases in premiums under the current program.



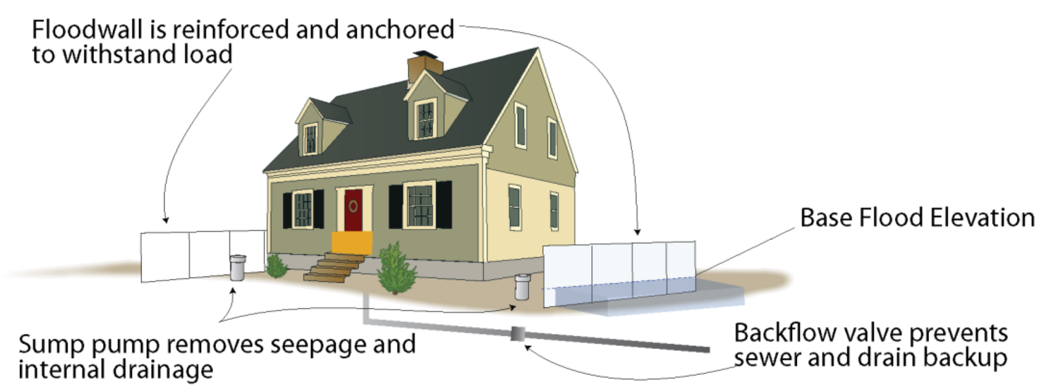
BARRIER MEASURES

FLOODWALL WITH GATES AND FLOODWALL WITHOUT GATES

This method creates a floodwall made of reinforced concrete that surrounds the residential building. This should only be constructed to a maximum height of four feet above ground level. The floodwall with gates will have passive flood gates that are designed to open or close


Typical masonry floodwall with engineered closures, which protected the Oak Grove Lutheran School in Fargo, ND, from flooding in 2001 (source: FEMA, Flood Control America, LLC

automatically when flood waters are present. The floodwall without gates uses vehicle ramps or pedestrian stairs rather than gates to access the property. Sump pumps or an internal storage system along with a back-up emergency power supply are needed to collect and remove floodwater that accumulates behind the floodwalls during a flooding event. This method can be effective at reducing or eliminating building and contents damage during a flood. Floodwalls are really only cost effective when flood depths do not exceed approximately four feet. There are also potential community and design restrictions related to building of the floodwall. This is a relatively high-cost measure that has an expected life span of 50 years. Other cost considerations entail professionally designed plans that meet floodplain management requirements, ensure that the floodwall will not divert floodwaters or adversely impact bordering properties and that the floodwall and its drainage system will meet the flood protection design standards. There are currently no discounts or decreases in premiums under the current program.



LEVEE WITH GATES AND LEVEE WITHOUT GATES

This option is similar to the floodwall, but the barrier is created by installing an earthen levee around a home with a clay or concrete core constructed to a maximum of six feet above ground level. This method can be built with passive flood gates that are designed to open or close automatically when flood waters are present. The levee without gates uses vehicle ramps or pedestrian stairs rather than gates to access the property. Sump pumps or an internal storage

system along with a back-up emergency power supply are needed to collect and remove floodwater that accumulates behind the levee during a flooding event. This method can be effective at reducing or eliminating building and contents damage during a flood. Residential levees can only be designed to withstand low velocity, low debris, and short duration flood events. This is a relatively high-cost measure that has an expected life span of 50 to 100 years. Other cost considerations entail professionally designed plans that meet floodplain management requirements, ensure that the floodwall will not divert floodwaters or adversely impact bordering properties and that the floodwall and its drainage system will meet the flood protection design standards. There are currently no discounts or decreases in premiums under the current program.

CASE STUDY OF FLOOD MITIGATION TECHNIQUES – DARLINGTON, WI

Darlington, WI — Located in the southwestern corner of Wisconsin, this rural city was founded beside the Pecatonica River and officially given the name of Darlington in 1869. Darlington is also the county seat and home of the Lafayette County Fair. During the past 172 years, this beautiful community has been at odds with the Pecatonica River. Numerous times the river wreaked havoc with its destructive force, leaving a trail of mud, debris and bacteria, contributing financial stress to both families and businesses. Repetitive flooding deteriorated structures and lowered property values. Owners experienced substantial loss of business during the times of flooding, cleanup, and repair. The buildup of mold and mildew in constantly flooded structures led to unhealthy conditions in the buildings. Most of the buildings date back to the mid-1800s and are of considerable historic importance. The continual flooding is well documented and photographed from 1937 and into the 1950s. As townspeople tired of the onslaught of the relentless river, many considered leaving town for good. Others closed long-time businesses and abandoned properties that were quickly becoming unsalable. Property values plummeted. It had become painfully clear that the multiple floods of the past 50 years had taken a terrible toll on Darlington.


Outside of a store in historic Downtown Darlington. Photo: WDNR


Pecatonica River Darlington, WI Photo: WDNR

After the 1993 flood, the community adopted four goals, as part of a comprehensive plan, in order to retain the historic and community value of Darlington's Main Street as well as to mitigate against future flood damage:

1. Preserve the historic downtown business district
2. Restore the downtown economic base.

3. Develop an urban river open space park and recreation area.
4. Eliminate or substantially reduce flood damage in the future.

Former Darlington Mayor Bev Anderson and FEMA Mitigation Specialist Chuck Black inspect stanchions and drain cover at top of steps leading in a Main Street business. It is at this point that flood shields are attached when flooding is imminent. Photo: Wisconsin DMA

The success in reaching the city's goals depended on forming an interagency coalition and promoting the cooperation of government — local, state, and federal— and businesses. Multiple agencies contributed grants and/or expertise to the projects. In developing the mitigation goals, officials ensured efforts were locally based by involving civic leaders, business owners, and residents in the planning. The plan included acquisition and demolition of businesses adjacent to the river that are subject to severe flood damage. Historic buildings in the downtown business district were retrofitted while maintaining their historic character. The engineered solution was to build a vestibule area as you step into the front door, at street level. Steps lead up to the elevated first floor level, and a floodwall separates the vestibule level from the first floor. Elevating the old businesses above flood levels was completed by the removal of entire first floors and filling existing basements with as much as nine feet of compacted pea gravel to new levels of four feet above the original first-floor elevation. New concrete slabs were then poured over the filled basements, with some slabs placed 13 feet above the original basement elevation.

The downtown district wasn't Darlington's only concern though. Adjacent neighborhoods and businesses also were being swamped by flood waters. As part of the town's total mitigation plan, other projects included elevating approximately 55 affected homes and their utilities above the base flood elevation (BFE) and filling in their basements with crushed rock. Some homes had concrete walls erected on the exposed sides prone to flooding. The city acquired and demolished 13 commercial properties and developed a 33-acre business park up and away from the floodplain for relocated and new businesses. The vacated land near the river was turned into a riverside park with a 1.2-mile paved trail, campground, and open green space. A portion of a 39-mile tri-county multi-use trail also runs through the park. To help address the downtown flooding problem, flood shields were designed to prevent flood waters from entering the downtown businesses. Made of a corrosion-proof aluminum, the shields would be clamped to rigid steel stanchions. The stanchions were to be cast into the top concrete entry portals, leading into the structure. Darlington officials approved fabrication of the flood shields at a total cost of about $200,000. Each of the 150 shields are numbered and lettered for the specific buildings on which they would be installed. Early warning from flood gauges up-river at Calamine, WI, affords Darlington at least eight hours' notice before flood waters reach the town.

Floodproofing the vestibule of a storefront, Photo: FEMA

Property owners were required to purchase flood insurance if they did not already have a policy. A major benefit of the entire project was a dramatic increase in property values city -wide. One city office official estimates that property values for the refurbished commercial buildings along the old main street have nearly doubled. During the two most recent Wisconsin floods, those of 2007 and 2008, the City of Darlington was "armored and ready." The flood shields stopped virtually all floodwater from entering businesses, elevated buildings and utilities prevented further damage, and the residents and business owners were afforded peace of mind in knowing they were protected this time.

This case study highlights that planning and implementing an effective flood mitigation plan in place can save time, money, and the fabric of the local community. Having a reliable warning system is crucial to allow the community to deploy the necessary flood mitigation tools, while also allowing them to evacuate if necessary. Elevating utilities and homes, relocating, the use of flood walls have been proven to mitigate the impacts of flood waters.

Restored and retrofitted building in Downtown Darlington, WI. Photo: FEMA

FLOOD RECOVERY PROGRAMS

In the event of a flood that has caused damage in a county or community, there are several recovery programs in the state of Wisconsin that can provide assistance. They consist of:

- Federal Emergency Management Agency (FEMA) Public Assistance (PA)
- Mitigation Funding Provided through Section 406 of the Stafford Act
- Federal Emergency Management Agency (FEMA) Individual Assistance
- Wisconsin Disaster Fund (WDF)

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) PUBLIC ASSISTANCE (PA)

The FEMA Public Assistance (PA) grant program provides assistance to State, Tribal, and local governments and certain types of private non-profit (PNP) organizations to help reimburse costs associated with damage to public infrastructure such as roads and bridges so that communities can quickly respond to and recover from major disasters or emergencies. FEMA funds the program, which WEM administers in the state. In order to be eligible for a Presidential Disaster Declaration, the event must overwhelm state and local response and recovery efforts, meet countywide damage thresholds ($3.68 per capita) and meet a statewide damage threshold ($1.46 per capita) of $8,303,000.00 using the 2010 census. Once approved by the President, FEMA provides 75% reimbursement of eligible documented costs, the State of Wisconsin provides up to 12.5% of eligible documented costs, and the local government's share is 12.5%. Through the program, FEMA provides supplemental federal disaster grant assistance for debris removal, life-saving emergency protective measures, and the repair, replacement, or restoration of disaster-damaged publicly-owned facilities, and the facilities of certain PNP organizations. The PA program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process. To request a federal disaster declaration, the Governor must request FEMA to come to the impacted county or counties and conduct a damage assessment of damaged public infrastructure such as roads and bridges. A FEMA inspector will determine if the damage is eligible under the federal program. The information gathered from a damage assessment will be provided to the Governor who will then request the President to approve a federal disaster declaration. Additional information on FEMA's public assistance program provides responsibilities, resources, fact sheets, and forms about the program.

- ***Local Governments, State or Tribal Agencies, Private Nonprofits:***
  - Perform damage assessments
  - Work with state or tribe to determine funding amount and priorities for HMGP
  - Encourage community members' involvement in hazard mitigation decision-making
  - Prepare and submit the grant application to the state or tribe
  - Determine sources of funding for non-federal match
  - After FEMA approval, sign and implement the grant agreement
  - Issue necessary permits
  - Manage and monitor the progress of the project and ensure compliance
  - Conduct final inspections and prepare for closeout

MITIGATION FUNDING PROVIDED THROUGH SECTION 406 OF THE STAFFORD ACT

The FEMA PA program provides funding to restore a damaged facility to its pre-disaster design, function, and capacity; however, during the repair work, opportunities to mitigate future damages in cost-effective ways often present themselves. The Section 406 Mitigation Program provides funding to an applicant to reduce potential of future, similar disaster damages. Some examples of this would include:

- Upsizing a repetitively washed out culvert
- Replacing a metal culvert with a cement culvert
- Elevating a road surface
- Elevation of equipment and control in a wastewater treatment plant
- Burying of overhead power lines
- Installing gabion baskets, riprap, or geotextile fabric to reduce or control erosion on a steep slope

There are different means to determine cost-effectiveness of particular mitigation measures. FEMA must approve proposed hazard mitigation projects before they can be incorporated. If you would like to include hazard mitigation into an open or future project, please contact our office for more information. Section 406 provides discretionary authority to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities. These opportunities usually present themselves during the repair efforts. The mitigation measures must be related to eligible disaster-related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. This work is performed on the parts of the facility that were actually damaged by the disaster and the mitigation provides protection from subsequent events. Mitigation measures must be cost-effective, technically feasible, and in compliance with statutory, regulatory, and executive order requirements. In addition, the measure cannot cause a negative impact to the facility's operation or surrounding areas, or susceptibility to damage from another hazard.

Section 406 hazard mitigation funding and Section 404 Hazard Mitigation Grant Program (HMGP) funding are two distinct programs that can sometimes be used together to more completely fund a hazard mitigation project and promote resilience. Section 406 mitigation funding can be used to restore parts of the facility that were actually damaged by the disaster to provide protection from subsequent events. Section 404 funding can then be used to provide future protection to the undamaged parts of the facility. Leveraging 404 and 406 funds in a concerted effort facilitates project scoping and development while extending the use of limited 404 funds.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDIVIDUAL ASSISTANCE

For the State of Wisconsin to qualify an Individual Assistance Declaration, FEMA inspectors would look to confirm 582 (according to CFR 44) homes major damaged or destroyed. Major damage to manufactured homes is described as the residence has been displaced from the foundation, block or piers and other structural components have been damaged. Destroyed is the structure is a total loss; frame is bent, twisted or otherwise compromised; missing the roof covering or the structural ribbing has collapsed for the majority of the roof system. For conventionally built homes, major damage is considered partial failure to structural elements of

the roof, walls, or foundation. Destroyed is complete failure of two or more major structural components (walls, foundation, or roof) or only foundation remains. To request a federal disaster declaration, the Governor must request FEMA to come to the impacted county or counties and conduct a damage assessment of damaged homes and businesses. A FEMA inspector will determine if the damage is eligible under the federal program. The information gathered from a damage assessment will be provided to the Governor who will then request the President to approve a federal disaster declaration.

- **Home/Primary Residence:** FEMA's Individuals and Households Program (IHP) provides financial and/or direct assistance to eligible applicants. FEMA provides housing assistance to individuals and families who have lost their homes as a result of a presidentially-declared disaster. If you are a renter or homeowner you may qualify for assistance. By law, FEMA assistance cannot duplicate the assistance you receive from your insurance company, but you may receive assistance for items not covered by insurance. If your home was impacted by a major disaster, we recommend that you apply for assistance.
    - Meet with community officials to decide on the type of mitigation project for your property
    - Check with the community to see whether community is supporting an application and whether your property can be included
    - Take photographs of damage and/or existing conditions
    - Maintain and organize papers or document damages
    - Complete and submit paperwork in a timely manner as requested by the community to support the grant application
    - Pay part of the project cost, if requested by the community
    - After approval of the project, work with your community to implement the mitigation project
    - Comply with the local community to ensure closeout of the project

In an Individual Assistance Declaration, the Individual Assistance program provides assistance to individuals and households, which may include:

- Housing Assistance includes Temporary Housing such as rental assistance.
- Repair provides financial assistance to help homeowners repair or replace disaster damage to their primary residence not covered by insurance. The assistance is intended to repair the home to a safe and sanitary condition.
- Other Needs Assistance (ONA) provides disaster assistance for some of your other disaster-caused expenses including medical and dental, child care, funeral and burial, essential household items, moving and storage, vehicle, some clean-up items, and other miscellaneous items. More information can be found at fema.gov/individual-disaster-assistance.
- Crisis Counseling – Assists individuals and communities in recovering from the effects of natural and human-caused disaster through the provision of community-based outreach and psycho-educational services.
- Disaster Case Management - A time-limited process that involves a partnership between a case manager and a disaster survivor to develop and carry out a Disaster Recovery Plan.
- Disaster Unemployment Assistance –Purpose is to provide unemployment benefits and reemployment services to individuals who have become unemployed as a result

of a Presidential disaster declaration and who are not eligible for regular State Unemployment Insurance.
  - Disaster Legal Services – This service is provided for survivors of presidentially declared major disasters only. Disaster legal advice is limited to cases that will not produce a fee.
  - Disaster Supplemental Nutrition Assistance Program (D-SNAP) – Through D-SNAP, USDA Food and Nutrition Service (FNS) is able to quickly offer short-term food assistance benefits to families suffering in the wake of a disaster.

- ***Business:*** FEMA does not offer assistance for small businesses impacted by a presidentially-declared disaster. However, we do partner with the Small Business Administration (SBA), which offers low interest loans for business damages. Learn more about the business loan application process.

- ***Secondary Home:*** FEMA does not offer assistance for your secondary home. Federal guidelines only allow us to provide housing assistance when your primary residence is impacted by a presidentially-declared disaster.

WISCONSIN DISASTER FUND (WDF)

The Wisconsin Disaster Fund (WDF) is a state-funded reimbursement program that allows local governmental units – namely, counties, cities, townships, villages, and tribal units of government – to recoup costs incurred while responding to and recovering from disaster events. The state reimburses 70% of eligible costs after the local governmental unit submits a complete WDF application. The fund does not cover individuals, businesses, the agricultural sector, costs associated with snow storms, damages covered by insurance, nor does it provide funds for mitigation activities. The fund does reimburse public disaster costs under three categories of work: debris clearance, protective measures, and road and bridge repair.

How to Apply

County Emergency Management Directors submit the following documents:

1. Within 24 hours of an event: Affected counties submit a UDSR ("Uniform Disaster Situation Report") to WEM, which provides basic information regarding the event.
2. Within 30 days of the event: A County Notification Form is submitted to WEM, which lists local jurisdictions seeking WDF reimbursement and their estimated recovery costs.

Within 60 days of the event, local governmental units – known as "Applicants" – submit the following documents after all recovery work is complete:

1. The **Applicant Request for State Public Assistance.**
   • Also, a Disaster or Emergency Declaration will need to be submitted, which can be a state, county, or local declaration, as long as it covers the Applicant's jurisdiction.
2. The **Local Documentation "Toolkit"** which allows the WDF office to interpret what the Applicant is claiming on a cost-by-cost basis. This is only submitted when ALL work is complete and documented.
   • All supporting documentation which includes timesheets for labor costs, invoices and cancelled checks for materials and contract work, and other supporting documents as needed.

The documentation submitted by local Applicants, especially the Toolkit and supporting materials, can be difficult to complete without prior knowledge of the WDF documentation process; therefore, applicants are encouraged to watch the WDF applicant briefing below. After watching the video, Applicants will learn that WDF reimbursement is based on documented costs in labor, equipment usage, purchased materials (such as gravel), and contracted work, as long as the work falls under one of the eligible categories of work: debris clearance, protective measures, and road and bridge repair.

WDF Contact Information
Wisconsin Disaster Fund Coordinator
Phone: 608-242-3259
Email: widisasterfund@wisconsin.gov

WDF Resources for County Emergency Managers
UDSR Form (PDF)
County Notification Form (Excel download file)

WDF Resources for Local Applicants
Applicant Request for State Public Assistance (Word document download file)
Applicant Documentation Toolkit (Excel download file)
Wisconsin Disaster Fund Administrative Plan
Wisconsin Disaster Fund Guidance Video
Any other questions or concerns should be directed to your corresponding county or tribal emergency manager listed below.

EXTERNAL COUNTY & TRIBAL EMERGENCY MANAGEMENT DIRECTOR LIST

Last updated July 23, 2018

*Listed A-Z by County/Tribe

Last Name	First Name	Region	County/Tribe	Business Phone	E-mail Address	Physical Address
Tank	Dorothy	Northwest	Ashland County	(715) 685-7640 ext. 456	dorothy.tank@ashlandcountysheriff.us	220 6th St. East, Ashland, WI 54806
Corbine	Tony	Tribes	Bad River Band	(715) 682-7123	anagrant@badriver-nsn.gov	Chief Blackbird Center, 72682 Maple St., PO Box 39, Odanah, WI 54861
Victorson	Jan	Northwest	Bayfield County	(715) 373-6113	jvictorson@bayfieldcounty.org	117 E Sixth Street, PO Box 423, Washburn, WI 54891
Tolbert	Jim	Northwest	Burnett County	(715) 349-2171	jtolbert@burnettcounty.org	7140 County Road K, #127, Siren, WI 54872
Kesler	Keith	Northwest	Douglas County	(715) 395-1391	kkesler@douglascountywi.org	1316 N. 14th St. Suite 10, Superior, WI 54880-1674
Ofstad	Stacy	Northwest	Iron County	(715) 561-3266	sofstad@ironcountywi.org	300 Taconite St., Suite 226, Hurley, WI 54534
Riedell	Matthew	Tribes	Lac Courte Orielles Band	(715)634-0347	Matthew.riedell@lco-nsn.gov	13394 West Trepania Rd., Hayward, WI 54843
Tillmans	Will	Tribes	Red Cliff Chippewa Tribe	(715) 779-3707 ext 2228	None	88385 Pike Road, Hwy 13, Bayfield, WI 54814
Sanchez	Patricia	Northwest	Sawyer County	(715) 634-2004	psanchez@sawyercountygov.org	10610 Main Street, Suite 89, Hayward, WI 54843
Buck	Taylor	Northwest	Washburn County	(715) 468-4730	cbuck@co.washburn.wi.us	421 Hwy 63, PO Box 429, Shell Lake, WI 54871

PRESIDENTIAL DISASTER DECLARATIONS

It is important to note two types of disaster declarations provided for in the Stafford Act: *emergency declarations* and *major disaster declarations*. Both declaration types authorize the President to provide supplemental federal disaster assistance. However, the events related to the two different types of declaration and scope and amount of assistance differ.

EMERGENCY DECLARATIONS

The President can declare an emergency for any occasion or instance when the President determines federal assistance is needed. Emergency declarations supplement State and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. The total amount of assistance provided for in a single emergency may not exceed $5 million. The President shall report to Congress if this amount is exceeded.

Requirements: The Governor of the affected State or Tribal Chief Executive of the affected Tribe must submit a request to the President, through the appropriate Regional Administrator, within 30 days of the occurrence of the incident. The request must be based upon a finding that the situation is beyond the capability of the State and affected local governments or Indian tribal government and that supplemental federal emergency assistance is necessary to save lives and protect property, public health and safety, or to lessen or avert the threat of a disaster. In addition, the request must include:

- Confirmation that the Governor or Tribal Chief Executive has taken appropriate action under State or Tribal law and directed the execution of the State or Tribal emergency plan;
- A description of the State and local or Indian tribal government efforts and resources utilized to alleviate the emergency;
- A description of other federal agency efforts and resources utilized in response to the emergency; and
- A description of the type and extent of additional federal assistance required.

MAJOR DISASTER DECLARATIONS

The President can declare a major disaster for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work.

Requirements: The Governor of the affected State or Tribal Chief Executive of the affected Tribe must submit the request to the President through the appropriate Regional Administrator within 30 days of the occurrence of the incident. The request must be based upon a finding that the situation is beyond the capability of the State and affected local

governments or Indian tribal government and that supplemental federal assistance is necessary. In addition, the request must include:

- Confirmation that the Governor or Tribal Chief Executive has taken appropriate action under State or Tribal law and directed execution of the State or Tribal emergency plan;
- An estimate of the amount and severity of damage to the public and private sector;
- A description of the State and local or Indian tribal government efforts and resources utilized to alleviate the disaster;
- Preliminary estimates of the type and amount of Stafford Act assistance needed; and
- Certification by the Governor or Tribal Chief Executive that the State and local governments or Indian tribal government will comply with all applicable cost sharing requirements.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

The National Flood Insurance Program is a federal program created by Congress to mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances and to provide access to affordable, federally-backed flood insurance protection for property owners. The NFIP is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHAs), the federal government will make flood insurance available within the community as a financial protection against flood losses. Communities not participating in the NFIP are subject to certain restrictions. If a nonparticipating community has identified flood prone areas, federal financial assistance such as a VA loan or a mortgage from a federally regulated or insured bank will not be available. Also, the community will not be eligible for federal assistance if a federally declared flooding disaster occurs; no direct federally insured loans or grants will be available; and no structures will be eligible for flood insurance.

Table 23: NFIP PARTICIPATION, REGION

Community Name	Date of Participation	Current Effective Map Date	Community Name	Date of Participation	Current Effective Map Date
Ashland County	2/15/1978	2/15/1978	Village of Oliver	2/2/2012	2/2/2012
Bayfield County	9/1/1988	12/16/2011	Village of Poplar	9/1/1986	2/2/2012
Burnett County	11/20/1991	8/19/2008	Village of Lake Nebagamon	8/15/1978	2/2/2012
Douglas County	2/4/1981	2/2/2012	Village of Solon Springs	8/15/1978	2/2/2012
Iron County	4/1/1988	4/1/1988	City of Hurley	4/6/1973	11/14/1975
Sawyer County	9/14/1990	9/14/1990	City of Montreal	11/4/1988	11/4/1988
Washburn County	6/8/1998	10/2/2012	City of Hayward	11/1/1979	11/1/1979
City of Ashland	9/30/1977	9/30/1977	Village of Couderay	Suspended	Suspended
City of Mellen	11/19/1986	11/19/1986	Village of Winter	DNP	DNP
Village of Butternut	Unknown	5/14/1976	Village of Radisson	9/1/1986	9/1/1986
City of Bayfield	9/18/1985	12/16/2011	Village of Exeland	9/1/1986	9/1/1986

Community Name	Date of Participation	Current Effective Map Date	Community Name	Date of Participation	Current Effective Map Date
Village of Mason	DNP	DNP	City of Spooner	4/2/1979	10/2/2012
City of Washburn	11/2/1995	12/16/2011	City of Shell Lake	9/16/1988	10/2/2012
Village of Grantsburg	2/2/1989	8/19/2008	Village of Birchwood	9/30/1988	10/2/2012
Village of Webster	8/19/2008	8/19/2008	Village of Minong	9/1/1986	10/2/2012
Village of Siren	8/19/2008	8/19/2008	Red Cliff	12/16/2011	12/16/2011
City of Superior	4/3/1978	2/2/2012	Lac Courte Oreilles	DNP	DNP
Village of Superior	DNP	DNP	Bad River	DNP	DNP

DNP= Community does not participate in the National Flood Insurance Program

REGULATORY TECHNIQUES

Floodplain zoning applies to counties, cities and villages in Wisconsin. Section 87.30, Wis. Stats., requires that each county, village and city shall zone, by ordinance, all lands subject to flooding. Chapter NR 116, Wis. Admin. Code requires all communities to adopt reasonable and effective floodplain zoning ordinances within their respective jurisdictions to regulate all floodplains where serious flood damage may occur within one year after hydraulic and engineering data adequate to formulate the ordinance becomes available.

LAND USE PLANNING

Counties in Northwest Wisconsin and several local governments have adopted comprehensive plans. These plans examine existing land use patterns, make recommendations for future development patterns, and contain goals, objectives and actions relating to transportation, housing, economic development, and land use. Each community is required to update comprehensive plans at least once every ten years.

HAZARD MITIGATION PLANNING

County Hazard Mitigation Plans identify strategies to address flooding and other natural disasters. Mitigation plans are a prerequisite to obtaining mitigation funding through certain FEMA grant programs. While typically prepared at the county scale, local jurisdictions can receive credit for planning by participating in the countywide process.

PLANNING FOR FLOOD RESILIENCE

It is ideal to start off with what it means to be a flood resilient community. A flood resilient community is one in which residents and institutions have the capacity to prepare for, respond to, and recover from flooding with minimal outside assistance. By becoming more resilient, communities are not just prepared to survive a major event, but are poised to adapt to ever-changing conditions and thrive.

In order to better achieve that outcome, the community can follow several guidelines to becoming a flood resilient community.

- **Manage water where it falls.** Land use activities throughout a watershed should utilize good stormwater management practices that prevent rapid runoff into streams and rivers. This may be as simple as maintaining soil cover and vegetation to slow water down and allow it to soak into the ground. When the soil is covered with buildings, pavement, or other impervious surfaces, engineered stormwater management practices may be needed.
- **Make room for water.** The highest risk areas near rivers, streams, wetlands, and lakes should be kept free from vulnerable development. The natural functions of these areas are to store and slow floodwaters, thus providing relief for other areas.
- **Live with floods.** In flood-prone areas with existing development and areas where future development will be permitted, measures can be taken to enhance safety and reduce the potential for damage.
- **Education the public.** If residents and business owners are knowledgeable about potential flood risks, they can make informed decisions that balance those risks with other concerns.

An independent study by the National Institute of Building Sciences found that every dollar spent on mitigation saves society an average of four dollars. Therefore, it should be seen as a fiduciary responsibility of local government to thoughtfully consider initiatives that reduce the potential impacts of hazards within their jurisdictions.

WHY PLAN?

Good planning makes better places to live. Effective planning protects the natural environment while enhancing economic well-being and the quality of life in general. Planning helps communities document their current conditions, visualize what their communities could be in the future, and develop strategies to meet those goals.

In keeping with the duty to protect the health, safety, and welfare, local governments should address flood hazards whenever any type of plan is developed for areas with flood risks. Integrating flood safety into a community's plans provides a basis for addressing these issues through policies, practices, regulations, and investment decisions.

COUNTYWIDE HAZARD MITIGATION PLANS

State and local governments develop Hazard Mitigation Plans to review the hazards facing a community and recommend long-term actions to reduce threats to safety health, and property.

A local Hazard Mitigation Plan that is approved by the Federal Emergency Management Agency (FEMA) is a prerequisite to obtaining FEMA mitigation funding.

Countywide multi-hazard mitigation plans are updated on a five-year cycle. In order to qualify for mitigation grants from the Federal Emergency Management Agency (FEMA), a municipality must participate in the planning process and adopt the hazard mitigation plan. This municipal involvement enables incorporation of local priorities, concerns, and recommendations. In order to facilitate implementation, it is recommended that the findings and recommendations also be integrated into comprehensive plans and municipal operations. The hazard mitigation plan can also be a valuable source of information about local hazards, vulnerability of communities to those hazards, and recommendations for mitigating the risks.

COMPREHENSIVE PLANNING

A comprehensive plan presents the long-term vision for a municipality, along with goals and polices to help achieve that vision. It is used as a strategic tool for guiding development and investment decisions to achieve a healthy and balanced community. A comprehensive plan serves three key functions:

- **Expression of a community's desires:** Comprehensive plans can address a variety of issues, including land use, housing, community services, public safety, economic development, transportation, infrastructure, natural resources, and recreation.
- **Guide to decision-makers:** The comprehensive plan is the blueprint upon which municipal land use regulations are based.
- **Legal document:** Provides evidence of coordinated effort and rationale for adoption of specified actions.

Municipalities can lay the foundation for improved flood resilience through their comprehensive plans. The plan specifies how a community should be developed and where development should not occur. The planning process provides an opportunity to assess flood risks, integrate flood safety into the community's goals, balance flood risks with other community priorities, and develop strategies for prohibiting or mitigating flood-prone development. Uses of the land can be tailored to match the land's hazards, directing development to areas that are less vulnerable. Hazardous areas can be reserved for parks, golf courses, backyards, wildlife refuges, natural areas, or similar compatible uses.

Steps in Comprehensive Planning

1. **Research:** This includes mapping of natural and human-made features; documentation of existing conditions, assessment of probable future trends, anticipation of potential problems, analysis of environmental and economic constraints, and identification of key issues.
2. **Community goals and objectives:** The process of setting goals and objectives should be an open one that includes citizens and groups who have a stake in the outcome. The plan must strike a balance between multiple interdependent issues and diverse viewpoints. A future land use map can be developed to illustrate how the community intends to grow over time.

3. **Policy formation:** Assess the options available for achieving the goals and objectives, including land use regulations, capital projects, development guidelines, and operating procedures.
4. **Plan implementation:** A comprehensive plan is not a law and cannot be enforced. It only has an effect when implemented through regulatory and non-regulatory actions.
5. **Review and updating:** Because conditions change over time, it is important for the community to conduct a periodic review of problems and progress and update the plan when warranted.

FLOODPLAIN PROTECTION

Flooding is a natural process. The amount of water in a stream or river varies seasonally and with intermittent extreme events. Natural features of an undeveloped stream system, including the floodplain, can moderate the severity of extreme events:

- **Stream channels** adjust to changing conditions (amount of water and sediment) to establish a dynamic equilibrium. Relocating a stream or disrupting the natural features within the channel can contribute to increased flooding or erosion damage while the channel adjusts its location and shape to restore a balanced condition.

- **The floodplain** is an important part of a stream system because it provides a place for water to spread out during high flows. This slows down the water and dissipates energy, which reduces the potential for streambank erosion. Storage of water on the floodplain also reduces the amount of flooding that occurs downstream. A river or stream that becomes disconnected from its floodplain due to berms or high banks is often a stream with erosion problems and downstream flooding.

- **Floodplain vegetation** enhances the ability of the floodplain to slow down and store water, while also stabilizing the stream system. Above ground, the trunks and leaves slow down the flow and dissipate energy, while the roots stabilize the soil and banks. Retaining or restoring plants along the bank of a stream, called a riparian buffer, is the easiest and most effective way to protect a stream system.

- **Wetlands** are areas that contain shallow water during all or part of the year. Whether they are located in the floodplain or in upland areas, wetlands store water and slow down the rate at which water reaches streams, and thus alleviate the flood potential. Wetlands also improve water quality and provide habitat for wildlife.

Natural systems can play a major role in mitigating hazards. An important flood damage reduction strategy is to preserve and restore the flood protection capacity of natural systems. Retention of natural floodplain features lessens the severity of flooding and also means that those areas do not contain development that will be susceptible to flood damage. Preservation of natural features outside of the floodplain can also help to reduce flooding. Communities may also capitalize on undeveloped land for recreational use, scenic value, and wildlife benefits. <u>What landscape features affect flooding?</u> The amount of flood water depends on the amount of water that drains off the landscape. So, preservation or restoration of natural drainage features anywhere in the landscape can attenuate flood peaks. Natural features to consider include:

- **Wetlands** can be located near streams or in other parts of the watershed. Regardless of location, they are valuable for slowing down and storing water.

- **Forests:** Vegetation throughout the watershed, especially mature forests, uses large amounts of water, reducing the amount that drains into streams. Plants also slow down runoff, especially on slopes, which spreads out the timing of water reaching streams and reduces peak flows. Vegetation also serves as a carbon sink, removing CO^2 from the atmosphere (and thus mitigating climate change). Harvesting of timber, like other land use changes, should incorporate drainage controls to avoid downhill and water quality impacts.

- **Soil:** During rainfall and snow-melt events uncompacted soil absorbs large amounts of moisture. Some water infiltrates downward and recharges groundwater resources. Additional soil moisture is returned to the atmosphere by plants. Any activity that includes grading, soil compaction, or concentration of runoff can contribute to down-slope drainage problems or flooding.

- **Slopes:** Development on steep slopes can be challenging due to difficulties with managing drainage and preventing erosion, as well as safe access roads. Disturbance of vegetation and soils in these areas may contribute to water quality impairment, downslope drainage or sediment problems, and even landslides.

EMERGENCY ACTION PLAN

The best way to prepare for flooding is to develop a proactive plan for storm response. An Emergency Action Plan outlines procedures and chains of command during any disaster, including flooding, in order to facilitate effective and efficient response. Municipalities can work with county agencies, local fire departments, school districts, and other entities to develop or update a plan.

<u>What is included in an Emergency Action Plan?</u> Although every plan is different, an Emergency Action Plan should include the following:

- Identify known hazards and steps that can be taken to reduce their occurrence or impact.
- Contain a notification system for officials and agencies who are designated to respond to emergencies.
- Describe emergency operations procedures, such as the activation and coordination of resources, and basic strategies for responding to various incidents.
- Describe how the community's resources will be organized, lines of authority, and chain of command.
- Describe the communications systems that will be used.
- Assign responsibilities for various aspects of emergency response.
- Contain resource lists to quickly obtain information, contacts, and equipment.

RECOVERY PLANNING – BUILD BACK SAFER AND STRONGER

After a flood or other disaster, there may be opportunities and community support for taking actions that reduce the affected areas' exposure to future damages. A Disaster Recovery Plan can allow communities to plan for safe reconstruction following a natural disaster. If a

community identifies in advance the desired land use in various parts of the floodplain, they are prepared to pursue funding for buyouts of flood-damaged structures in areas more suitable for use as open space. The goals of recovery planning are generally to

- Increase the speed of recovery,
- Promote effective use of resources, and
- Increase the opportunity for community betterment.

How-to guidance: "Planning for Post-Disaster Recovery: Next Generation," American Planning Association, PAS Report 576, www.fema.gov/media-library/assets/documents/103445.

When should a Disaster Recovery Plan be prepared? Ideally, the Recovery Planning process is conducted during normal times, without the pressures of disaster response and recovery. However, most municipalities lack the capacity and interest to undertake pre-disaster recovery planning beyond the broad community goals included in Hazard Mitigation and Comprehensive Plans and short-term recovery recommendations in an Emergency Action Plan. It is more likely that Recovery Planning by municipalities will be conducted in the aftermath of a severe flood or other disaster.

A flood is always an opportunity to highlight where changes are needed. During and after a flood or other disaster, emergency management activities focus on protecting lives and property, then getting things back to "normal" as quickly as possible. However, if the community is restored to the "normal" that existed before the flood, then the same flood problems are likely to occur again and the opportunity for improving the community and building resilience will be lost.

A post-disaster Recovery Plan must **quickly address the following questions**:
- What areas should be cleared or not restored to pre-disaster conditions?
- What areas should incorporate retrofitting as part of reconstructions?
- What areas could be allowed to repair without delays?
- What changes should be made during rebuilding to make the community more resilient or sustainable?

The **key points to remember** while making these planning decisions are:
- The area will flood again someday.
- It could be worse next time.
- The community can do things to make it better next time.

Incorporating planning into the busy flood recovery process will take time, leadership, and participation of local stakeholders (elected officials, emergency personnel, planners, businesses, human service providers, civic organizations, and—of course—residents). To buy time, a **temporary reconstruction moratorium** can freeze reconstruction in the affected area until decisions can be made about who can rebuild, who must mitigate, and who can make repairs and reoccupy right away.

Public information and involvement are essential for developing a successful flood recovery plan. The plan will address subjects that are central to the lives of those who live in the affected area. It will determine where they live and work in the future, and their lives may be held in limbo until the plan is completed. Dealing with the needs and emotional responses from

these residents needs to be conducted in a "listen and gather information" mode rather than a "plan presentation" mode.

RESOURCES FOR FLOOD RECOVERY AND RECOVERY PLANNING

- "Planning for Post-Disaster Recovery: Next Generation," American Planning Association, PAS Report 576, www.fema.gov/media-library/assets/documents/103445. How-to guidance for communities to start their mitigation planning and disaster recovery planning processes.
- "Planning and Building Livable, Safe & Sustainable Communities: The Patchwork Quilt Approach," Natural Hazard Mitigation Association, http://nhma.info/publications
- Information about programs that provide technical assistance and funding to support post-disaster recovery.
- "NAI How-To Guide for Planning," Association of state Floodplain Managers, July 2014, http://floods.org/ace-images/PlanningFinal6_16_16.pdf. Planning tools and case studies to help communities develop plans that "aim high" and reduce adverse impacts from flooding.
- FEMA webpage, "Part 2. Recovery Planning," http://www.fema.gov/resources-plan-post-disaster- recovery. Links to tools, case studies, example plans, and other resources to help communities with post-disaster recovery planning.

OTHER LOCAL PLANS AND PROGRAMS

Communities undertake a variety of planning efforts, each focused on particular assets or concerns. Since the objective of each plan is to improve the community in some way, long-term resilience should be a consideration for any local plan. In the flood-prone Northwest region, planning for long- term resilience must include consideration of flood risks. Recommendations in the previous sections of this guide can be used to integrate flood resilience into other local planning efforts, including:

- Watershed plan
- Economic development strategy
- Capital improvement plan
- Local waterfront revitalization plan
- Open space or natural resource plan
- County water quality strategy
- Facility plan

COMMUNITY RATING SYSTEM

The Community Rating System (CRS) is a FEMA financial incentive program to promote adoption of stronger policies to reduce flood damage. If communities document that they have policies and programs that reduce the risk of flood damage, they can be rewarded with a reduced flood insurance rate for all landowners within the municipality. Information about this program is at:
https://www.fema.gov/national-flood-insurance-program-community-rating-system

ZONING

What is zoning? Zoning is a land use tool that regulates development by dividing a community into zones or districts and setting development criteria for each zone or district. The zoning law specifies the uses that are permitted in each zone, requirements for structural characteristics, site layout requirements, and procedural matters. Dimensional requirements may include minimum lot sizes, building setbacks, lot coverage restrictions, and building height requirements.

Because zoning is a tool for directing different kinds of development to appropriate areas within a community, zoning regulations can be used to prevent flood damage and to protect natural resources by limiting uses in high-risk and environmentally-sensitive areas.

WATERBODIES AND BUFFERS

What is a riparian buffer? A riparian buffer is the area along a stream, river, or lakeshore where vegetation is retained to act as a buffer between the water and the adjacent land. Because it is natural for streams to flood and for stream channels to change course over time, keeping this buffer area free of development means that buildings and roads are located away from the waterbody in safer locations. Preventing development near streams and lakes also preserves many natural benefits, particularly if the riparian buffer contains a variety of types of plants—trees, shrubs, grasses, and forbs. The beneficial functions of vegetated stream buffers include:

- Slow water during high flows
- Stabilize banks
- Reduce erosion
- Promote sediment deposition in the floodplain
- Filter nutrients and other pollutants
- Moderate water temperature
- Provide wildlife habitat and corridors
- Enhance the scenic beauty

Locating development away from stream and river banks is the most effective way to protect the development from the frequent flooding and erosion that occur along streams. Well-established vegetation on streambanks and in adjacent riparian areas is generally the best and least expensive long-term protection for a stream system. Streams and rivers are active systems that cause flooding and erosion of adjacent areas. Maintaining a vegetated buffer adjacent to streams, rivers, wetlands, and lakes keeps development away from these high-risk areas, while providing multiple benefits for water quality, stream functions, and wildlife. Local ordinances and codes can be used to limit or prohibit certain types of (or all) development within stream corridors or near waterbodies. These local restrictions can be adopted as part of a zoning code, as a stand-alone ordinance, or as part of other regulations.

What is a wetland? Wetlands are areas that are submerged much of the time and support unique forms of vegetation. Because wetlands store stormwater runoff, their preservation can have valuable flood protection benefits. Development in or adjacent to wetlands is regulated by state and federal permit programs, which local governments can support by providing information and assistance as needed. A municipality can also enact a local wetland law.

However, local involvement in regulating wetlands is generally limited to indirect regulation through subdivision and site plan review laws, which should guide development so as to avoid areas of a site that would inappropriately affect a wetland.

RUNOFF MANAGEMENT

Runoff can worsen flooding. If a stream is flooding frequently, it is possible that development in the surrounding area might be contributing to the problem. Development often converts pervious surfaces (such as soil), which might have previously absorbed rainfall, to impervious surface (such as concrete or pavement), which increases stormwater runoff. Grading, lawns, roads, drainage ditches, and other drainage "improvements" can also increase the speed of runoff, resulting in more water reaching the creek at the same time. Managing stormwater onsite reduces additional flow to flood-prone areas, while also protecting water quality.

What is poor drainage or urban flooding? Poor drainage flooding is when heavy rainfall or snowmelt overwhelms drainage systems. This is sometimes called urban flooding (or pluvial flooding), but it occurs in rural areas also. Because damage is caused by runoff before it reaches a stream, it can cause damage far from streams in areas where the flood risk is not shown on floodplain maps. Factors that contribute to flood and erosion damage from poor drainage include:

- Increased runoff due to pavement and other impermeable surfaces that prevent water from soaking into the soil.
- Increased runoff due to removal of vegetation. Bare ground can generate almost as much runoff as pavement, particularly if the soil is compacted. Mowed lawns are not nearly as effective at intercepting and soaking up water as forests.
- Concentrated flow due to grading and construction of drainage ways, which enable water to move at higher velocities, causing erosion and allowing water to reach streams quicker.

What is green infrastructure? "Green infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring, harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site- and neighborhood-specific practices, such as bioretention, trees, green roofs, permeable pavements and cisterns." (Source: US Environmental Protection Agency website, https://www.epa.gov/wifia/learn-about-wifia-program#questions.)

1. **Avoid or minimize disturbance by preserving natural features or using conservation design techniques.** Preserving contiguous forests, stream buffers, floodplains, and wetlands can slow the rate of runoff and protect water quality by filtering and infiltrating polluted water.
2. **Reduce the impacts of development by decreasing impervious cover.** Reducing impervious surfaces such as buildings, roads, driveways, and parking lots reduces the speeds and volumes of runoff as well as the amount of pollutants that are collected on site and washed into waterbodies.

3. **Manage the remaining impacts of development by using natural features and runoff reduction practices to slow down the runoff, promote infiltration and evapotranspiration, and minimize the need for structural "end-of-pipe" practices.** Using practices such as bioswales, rain gardens, rain barrels, green roofs, and vegetation can help manage runoff by allowing it to be collected, distributed, and filtered.

The green infrastructure approach for stormwater management should be incorporated into the early stages of review for development and subdivision proposals. Guidance and checklists to assist Planning Boards with this have been prepared by the Genesee/Finger Lakes Regional Planning Council, "Green Infrastructure Planning Design Guidelines," 2016, www.gflrpc.org/uploads/5/0/4/0/50406319/giplanningdesignguidelines.pdf.

Areas with known flooding problems

New development should be designed and constructed in a manner that accommodates any known flooding or drainage problems, regardless of whether it is located within a mapped floodplain. This can be achieved by including the following requirement in zoning, site plan review, and subdivision regulations:

"When a land development project is within or adjacent to any area with known flooding problems or known high ground water, the elevations of buildings should be above the observed, anticipated or computed water levels. The effect of such development on upstream and downstream reaches of the watercourse and adjacent properties shall be considered and adequate protective measures shall be implemented."

PUBLIC ROADS

By their very nature, road systems are subject to flooding. Roads sometimes follow along waterways, bridges often constrict flood flows, and roadside drainage ditches intercept hillside drainage and concentrate it along the roadway. Flooded and washed out roadways can be extremely hazardous to the traveling public. The National Weather Service reports that **almost half of all flash flood fatalities occur in vehicles**. [2]

In the course of maintaining and repairing public roads, a community may have opportunities to improve flood resilience of the road system and reduce the impact on waterways. "Flood-Resistant Local Road Systems: A Report Based on Case Studies" (American Lifelines Alliance, January 2005, https://www.floods.org/PDF/ALA_Flood_Roads_January2005.pdf.) identifies the following practices that improve flood resistance:

- **Improving flood resistance: hydraulics:** Improvements to hydraulic performance are examined, and protection against scour is incorporated for every new crossing and for replacements of existing crossings.
- **Record keeping: labor, equipment, and materials:** Documentation of work performed, including labor, equipment, and materials, is maintained by road segment and crossing location; records are filed to facilitate identification of changes in conditions over time.
- **Periodic inspections:** A formalized program of periodic inspection of waterway crossings to identify, document, and monitor, over time, conditions known to contribute to vulnerability to flood damage is essential.

- **Functional partnerships: adjacent communities:** Interjurisdictional partnerships are formed to cost-effectively co-operate to provide for the overall safe functioning of local road networks.
- **Funds for flood recovery:** Provisions are made for some anticipated flood-related expenditures that exceed the normal budget so that funds are not diverted from routine maintenance and scheduled capital improvements.
- **Bridge construction crew and equipment:** In-house crew capabilities and available heavy equipment are sufficient to construct the types and sizes of the most prevalent waterway crossings in the local road system.
- **Partnerships: state and federal agencies:** Awareness of state and federal programs that provide technical and financial assistance is maintained; partnerships are identified and are pursued.
- **Watershed and stream morphology approaches to flood problems:** It is recognized that watersheds and streams are systems and that solutions to site-specific problems may involve off-site elements.
- **Staff development:** Personnel are trained and cross trained, both in-house and through external opportunities, in the skills required to perform agency tasks.

Roadside ditches don't just capture road runoff. They also intercept about 20 percent of runoff from adjacent hillslopes. Each ditch provides a high velocity sluiceway that rapidly shunts water, debris, and contaminants into downstream waterways. These ditch networks increase the magnitude of peak stream heights and contribute directly to flooding. Road ditches also contribute to water pollution and degrade aquatic habitat. Information about "re-plumbing" roadside ditches to reduce contributions to flooding can be found in the publication "Re-plumbing the Chesapeake Watershed: Improving roadside ditch management to meet TMDL water quality goals."

CULVERT ASSET MANAGEMENT

The United States of America has the world's biggest transportation network system. The industrial growth during 1950s marked a rapid development in construction of high speed, high-capacity roadway infrastructure. Today, the United States has 3,981,521 miles of roadway of which 46,726 miles belong to national highway system, 2,318,043 miles are paved roadway and 1,624,207 miles are unpaved roadway, which is the largest in the world.

During the construction of these roadways, billions of culverts were installed under them. As the philosophical saying, "out of sight is out of mind," more importance has been given to preserving the physical infrastructure on the surface like roadway, pavements, bridges, guardrails, etc., than underground infrastructure. Various theories, models, framework and management plans are developed to track, inspect, maintain, and repair the surface infrastructure. However, the invisible critical components of culverts have been neglected. The location and condition of these pipes comes to notice only when there is a problem such as settlement or complete failure of a roadway. The deterioration of culvert pipes and other components is a growing problem for transportation agencies. The deterioration of pipes because of their increasing age or change of service conditions such as increasing flow due to changing watershed conditions increases the wear and tear of these pipes. Various structural, hydrological, environmental and economical (lack of proper maintenance) factors, may accelerate the deterioration process.
Drainage infrastructure systems (culverts, storm sewers, outfall, and related drainage elements) represent an integral portion of Department of Transportations' assets that routinely require inspection, maintenance, repair, and renewal. Failure of these systems is costly for DOTs both directly due to the replacement of the failed system and indirectly due to the time and money and even in some cases lives lost for the users of the highway. Therefore, drainage infrastructure systems are in need of special attention in terms of proactive/preventive asset management strategy.

The variety in material types, shapes, backfill materials, types of roads located above, and environmental conditions make every single culvert unique in terms of its behavior and durability. There have been many studies in order to identify the key parameters affecting culvert behavior but the success rate in providing standard solutions to the problems remained to be low. Had the culvert behavior been completely understood it would have been much easier to manage the culvert inventory by timely renewal and repair efforts.
Wide geospatial distribution of drainage infrastructure assets further complicates the management of these assets. Therefore, the first and most important step in the culvert asset management procedure should be the establishment of a database consisting of asset inventory and asset condition information. By monitoring this database, the department of transportation officials will be able to identify the critical culverts before failure and to take necessary steps in a timely manner to repair, rehabilitate, or replace these culverts.

Additional culvert asset management benefits include:

- Up-to-date inventory
- Reducing failures through inspections
- Reducing emergency repair costs and unplanned financial burden
- Better budget planning for repair and replacement
- Long term ability to identify actual life-cycle and performance of various pipe materials

ROAD AND CULVERT PROBLEMS ASSOCIATED WITH FLOOD WATERS

PLUNGE POOLS, STREAM BANK SCOUR, & SEDIMENT DEPOSITS

An undersized culvert produces an 'hourglass effect' with the upstream segment widening due to sediment deposition, while at the same time a downstream plunge pool scours a wide area. The formation of a scour hole or streambank erosion on the downstream side of the crossing provides evidence that an existing crossing is undersized and/or not properly aligned (slope or skew). The primary cause of this phenomenon on the downstream is the 'fire-hose' effect of high velocities through the crossing. Scour can also destabilize the end sections and roadbed. If a culvert is not to be replaced, scour hole protections such as riprap and/or grade control should be considered.

Photo: Google Maps©

Scour holes can be seen in the adjacent air photo. They are typical of undersized culverts and are found throughout the region in a variety of topography.
The accumulation of sediment on the upstream side of the crossing provides evidence that an existing crossing is undersized. When there is a stage increase of the headwater elevation (ponding) it causes a change in water surface slope. The slower water drops a portion of its load of suspended solids (gravel and silt). Vegetation can also become established on these deposits, thus compounding the adverse impact to the crossing's hydraulics. There are no long-term solutions other than replacement with a properly designed culvert. Without replacement, maintenance crews can expect to regularly remove these deposits in order to maintain hydraulic capacity. Failure to do so may increase potential for road overtopping.

DEBRIS ACCUMULATION

Photo: Minnesota Department of Natural Resources

A crossing that does not pass debris is vulnerable to plugging and failure during a flood event. A properly sized crossing will pass debris (including ice). If there is a history of debris maintenance at a location, it indicates the opening is too small. The replacement crossing should be redesigned with a properly sized crossing. Woody debris is a problem in many parts of Wisconsin.

PERCHED OUTLET

Perched culvert along the North Shore of Lake Superior in Minnesota. Photo: MN DNR

Perched crossings are those that have a drop of water level at the downstream end of a culvert. These are common obstacles to upstream movement of aquatic species. This situation can be due to several reasons, including improper invert elevation at installation. If a culvert has both an upstream aggradation deposit and a perched situation, it is due to an undersized culvert. A stream's interrupted bedload capacity, due to an undersized opening, causes both upstream aggradation (sediment deposits) and causes the stream to perch the outlet when water picks up downstream material as it re-establishes bedload carrying capacity. If a perched culvert has no upstream aggradation, there are velocity issues (downstream scour hole) that have continued unchecked. In flood conditions perched culverts can backcut and undermine the culvert and associated road grade. Options to reestablish fish passage are either complete replacement with properly sized culvert or retro-fitting the outlet with grade control such as rock rapids (series of weirs).

ROAD OVERTOPPING

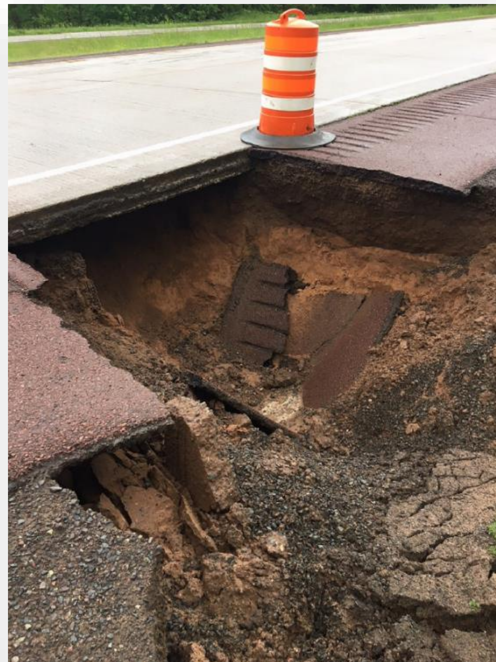
An extreme example of what can happen with overtopping. Photo: MN DNR

Increased frequency or higher than predicted water depths during road overtopping is an obvious indicator that the crossing is no longer functioning within the desired parameters. This is caused when floodwaters flow unimpeded across roads. This can be dangerous and costly, causing erosion, shear stress, and scour. This can eventually lead to a breach or washout of the entire roadway. Raising the roadway to prevent overtopping is not a feasible solution, as flood plain law does not allow moving the problem elsewhere by backing up the water.

CULVERT FAILURE CASE STUDIES

A culvert was partially washed out at U.S Highway 53 near Solon Springs, Wisconsin in June 2018. The damage occurred when the area was hit in excess of ten inches of rain. This closed two southbound lanes for over two weeks during peak tourist season. This cost $170,000 to replace the two culvert pipes.

The washout on a bridge over the Black River on State Highway 35 near Pattison Sate Park in Douglas County closed down that area for several weeks. This was hit by the same storm as described previously. There was a partial collapse of the bridge and the north shoulder was washed out. This was a $950,000 project to repair the pavement, the shoulder along the highway, and to replace concrete slabs that lead to the bridge.



Wisconsin Highway 53 near Solon Springs sustaining damage from the June 18, 2018 flood. Photo: Wisconsin State Patrol and County Emergency Officials

Wisconsin Highway 35 over Black River sustains damage from flash flooding in Pattison Sate Park in Douglas County on June 18, 2018. Photo: Wisconsin Department of Transportation

A road was completely washed out on U.S Highway 2 at North Fish Creek in Bayfield County in the same storm that impacted the two previous case studies. This closed down this popular northern route for over two months, creating extensive detours and becoming a $2.2 million project to replace the previous culvert with a bridge. Ideally it should be able to handle a similar sized flood in the future.

U.S. Highway 2 near Ino has been washed out between County Highway G and Tomich Road in Bayfield County on June 18, 2018. Photo: Wisconsin Department of Transportation

On July 11, 2016 a storm dropped upwards of 11 inches onto the 17 square mile watershed that holds Saxon Harbor in Iron County. The flood waters washed out a bridge as well as a 90-foot-long by 10 feet high culvert on Highway A. Both the bridge and culvert have been replaced with an improved bridge that can handle greater amounts of water flow, costing millions of dollars.

Saxon Harbor, Wisconsin, after a devastating storm in early July, 2016. Photo: Wisconsin DNR

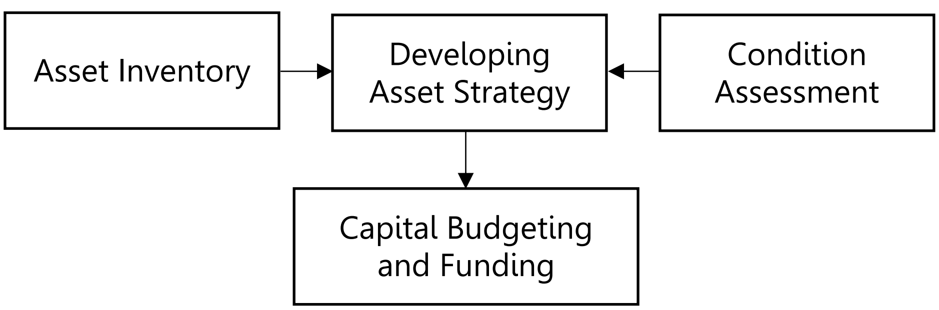
A culvert was completely blown out on State Highway 13 near Highbridge, Ashland County, WI in July 2016. It washed out hundreds of cubic yards of fill material. According to the DOT, the highway gets a daily volume of 2,700 vehicles. The replacement of the culvert with a flood resistant bridge carried a price tag of $2.8 million. The new bridge withstood the flooding in June 2018 that hit the region, accruing minimal damage.

People observe part of Wisconsin Highway 13, washed out after heavy rains, south of Highbridge in Ashland, Wis., Tuesday, July 12, 2016. Storms carrying tornadoes, torrential rain and powerful winds damaged homes, deposited a snowplow in a tree and flooded highways in north-central Minnesota and northern Wisconsin. Photo: Jeff Peters, AP.

The case studies highlighted indicate that flooding is becoming a greater issue that is overwhelming an outdated and undersized culvert system. Other factors, such as corrosion, overloading, ground movement, heaving, etc. may also contribute to failure. Identify and gauging the amount of damage that certain culverts are prone to flooding is a difficult task. Having a strong approach to infrastructure asset monitoring can greatly reduce risk and costs.

CREATING A CULVERT INVENTORY

→Having a current inventory of assets.
→Documenting the condition of those assets, using a condition assessment procedure.
→Demonstrating that the assets are being preserved at a determined condition benchmark.
→Estimating the actual cost to maintain and preserve the assets.



To start inventorying culverts, it is ideal to have a generic and effective way of taking and recording data. Collaborating with surrounding communities and counties to create a data sheet that can be used by all parties will help create a uniform dataset that can benefit everyone.

EXAMPLE INVENTORY FORM

Survey ID		**Date**	
Site ID		**Time**	
Road Name		**Book #**	
Milepost		**Crew**	
Watershed		**Lat.**	
Stream		**Long.**	

Culvert Description: Pipes numbered left to right facing downstream

	Units	1	2	3	4	5
Culvert Type						
Culvert Material						
Structure Type						
Inlet Type						
Inlet Apron Length	ft.					
Inlet Width	ft.					
Inlet Height	ft.					
Substrate Depth Inlet	ft.					
Rust Line Height Inlet	ft.					
Sedimentation at Inlet?	Y/N					
Outlet Type						
Outlet Apron Length	ft.					
Outlet Width	ft.					
Outlet Height	ft.					
Outfall Type						
Substrate Depth Outlet	ft.					
Corrugation Depth	in.					
Corrugation Width	in.					
Culvert Length	ft.					
Embedded?	Y/N					
Embedded Depth	ft.					
Condition Rating (5= best)	1 to 5					
Outfall Height	ft.					
Pipe Gradient	%					
Water Depth at Outlet	ft.					
Max Gradient	%					
Length of Max Gradient	ft.					
Stream Gradient	%					
Backwatered?	Y/N					
Stream Approach Angle						

Habitat Elements	Upstream	Downstream	Inlet	Outlet
Dominant substrate				
Subdominant Substrate				

PHOTOGRAPH LOG PAGE

Maintaining a photograph log page is very important. Having detailed notes and clear photographs can help explain a typical structures or site conditions that cannot be covered in the data sheets. This can save time and money in the long run if done thoroughly. The photograph log page is a log of all photographs in the order they were taken. It is also helpful to record the numbers the camera assigns each photograph. Move obstructions like tree branches out of the way to allow a clear, unobstructed view of the culvert. Make sure the lens is clean, is not fogged, and does not have water droplets on it. Check photographs after taking them to be sure they are in focus and clear of obstructions and contain all the information intended.

Required photographs include:

- Site Marker. The Survey ID, road name, and date are written on a whiteboard and photographed. This is the first photograph taken at each site.
- View of the road surface at the crossing site.
- View from the culvert looking downstream at the tail crest and beyond.
- View from downstream of the tailwater control (or about 50 feet downstream if there is no tailwater), looking upstream at the culvert(s). The photograph should show the culvert outlet type, condition, road embankment, and the tailwater control if present.
- If the site has more than one culvert, take pictures of the culverts as a group and each inlet and outlet separately. If there is a large outlet perch, photograph this with the survey rod for scale.
- View from an upstream location (looking downstream), showing the culvert inlet type, condition, and road embankment. This photograph should show channel roughness (substrate, debris, vegetation, etc.) and culvert inlet conditions.
- Photographs from the inlet and outlet showing the interior of the culvert. These photographs are used to show rust line height, and, if present, culvert damage, multiple grades, and/or obstructions.
- Photographs of the inlet and outlet at close range showing detail of perches, rust lines, and anything else interesting to the site.
- Views from the culvert looking upstream and downstream. These photographs should show vegetation and general channel type directly upstream and downstream of the culvert but outside of the culvert's influence.
- A photograph of typical stream substrate and other channel roughness elements upstream of the culvert's influence. An object of known size, such as a measuring stick or field notebook, should be used as a reference.

Once the process has been completed and the community has a robust culvert inventory, a risk assessment can be conducted to identify suspect culvert locations that are vulnerable to flooding. With the current data for the NW Region of Wisconsin, very little is known about the integrity of thousands of culverts. A strong inventory can save time, money, damage to property, and possible injury and loss of life.

CURRENTLY EXISTING CULVERT DATA FOR NORTHWEST WISCONSIN

Accurate and recent culvert inventories range in robustness throughout Northwest Wisconsin. Previous identified locations of culverts were used as an aid in the creation of drawing "cutlines"

for the modeling of the flooding scenarios. Areas that were marked as having a culvert, usually had a culvert at that area and allowed an accurate "cutline" to be drawn. The data from the varying sources, often times overlap as both parties will have identified the same culvert. Culvert data can be seen from the following sources. The data created by NWRPC is in part based on the preexisting culvert data.

Table 24: POTENTIAL CULVERT DATA SOURCES, REGION

Data Source	Location (County)	Number of Identified Culverts
Ashland County Highway Department (Land Records Office)	Ashland	260
Bad River Watershed Association	Ashland/Bayfield/Iron	1141
Bayfield County Highway Department (Land Records Office), U.S. Fish and Wildlife Service, Bayfield County Land and Conservation Department	Bayfield	302
Douglas County Highway Department (Land Records Office)	Douglas	425
National Bridge Inventory	Ashland, Iron, Sawyer	99
National Forest Service	Ashland, Sawyer	92
*Northwest Regional Planning Commission	Ashland, Barron, Bayfield, Burnett, Douglas, Oneida, Iron, Polk, Price, Rusk, Sawyer, St. Croix, Vilas	14,140
WI Department of Transportation	Ashland, Iron	14
WI Department of Natural Resources	Bayfield, Douglas	136

** Denotes data created with the aid of previously existing culvert datasets.*

LIMITATIONS OF FINDING "DAMAGED LOCATIONS"

With the use of this culvert inventory, along with the aid of Lidar data, aerial imagery, and the Agricultural Conservation Planning Framework tool in ArcGIS, potential culvert locations were created and applied to the model. A total of 14,140 culverts were drawn through this manner. It should be noted that these are potential culvert locations and that they have not been field checked or verified. Again, the data created is based on tools used in ArcGIS and aerial imagery. It is purely an estimation of possible impediments to the flow of water. The tools used in ArcGIS help shows areas of ponding on the earth's surface. Areas of ponding would then indicate a likely culvert location, but at times aerial imagery showed evidence of no impediment. The aerial imagery used in this process ranged in release date. This may have allowed time for the installation of culverts after the imagery was published to what is actually there.

CULVERT SIZING PROCEDURES FOR 1% (100 YEAR FLOOD) PEAK FLOW

There are several methods to estimate the size (diameter) of a culvert that should be installed in a stream crossing that is to be constructed or upgraded. Determining the right size (diameter) culvert first requires estimating the peak flood discharge that can be expected at each stream crossing during the 100-year flood. Once the peak discharge of the streamflow is known, then the size of the culvert can be determined.

Method 1. The Rational Method of Estimating 100-Year Flood Discharge

This technique is best employed for estimating 100-year flood discharges for small ungauged forested watersheds. This method assumes the stream sites have the same geomorphic and hydrologic characteristics. The information needed can be easily obtained from local rain gages and topographic maps. This method reflects the local environment well and therefore is most effective with watersheds smaller than 200 acres.

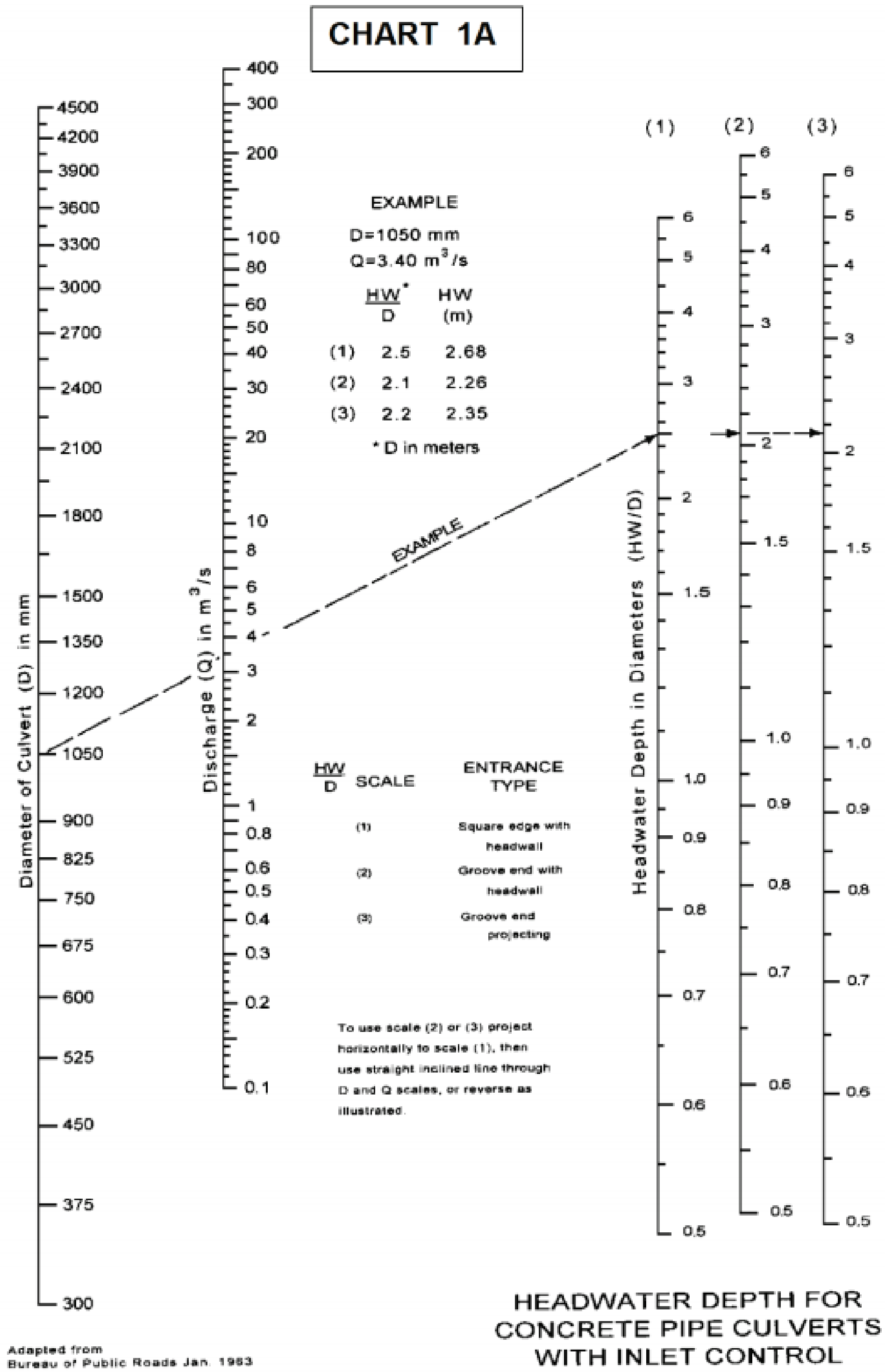
Method 2. The USGS Magnitude and Frequency Method for Estimating 100-Year Flood Discharge

The USGS technique is based on a set of empirical equations based on precipitation and run off data collected from more than 700 stream gaging stations. This method assumes the 100-year design storm uniformly covers large geographic areas and that watershed characteristics are homogenous. This way is beneficial because mean annual precipitation data are readily available, the equations are based on a wide variety of gage data, including rain and snow events, and because the mean basin elevation is easy to determine from USGS topographic maps. However, it generalizes vast geographic areas and can over and under estimate at the local watershed level so it is ideal for larger watershed areas (>100 acres).

Method 3. Flow Transference Method for Estimating 100-Year Flood Discharge

For proposed stream crossings that are located in or nearby a hydrologically similar watershed that has a long-term gaging station, the 100-year design flood flow can be calculated for the one that has no gaging station. The 100-year discharge is calculated by adjusting for the difference in drainage area between the two watersheds. This is under the assumption that both stream sites have similar geomorphic and hydrologic characteristics. Watersheds that are geographically closer and are more similar will produce better results using this method. Again, once discharge is computed, the size of the culvert can be determined using the Federal Highway Administration (FHWA) Culvert Capacity Nomograph.

Federal Highway Administration chart for sizing concrete pipe culverts with inlet control. Source: FHWA



The FHWA method is a commonly used tool throughout the U.S. to determine the culvert diameter based on calculated design stream flow and headwater depth ration. Depending on the culvert "entrance type' will impact the size of the culvert used. Culvert entrances range from projecting (barrel shaped) inlets to mitered or beveled inlets. Calculating the "Headwater Depth Ratio" for the proposed stream crossing is the next step. This is ratio of the height of the fill where water would begin to spill out of the crossing to the bottom of the culvert to the diameter or rise of the culvert inlet. Using the correct chart from the FHWA, the correct projected inlet culvert can be determined for a 100-year flood event.

For streams that are especially woody and full of sediment, plugging is a common concern. Using either an oval or arch culvert will reduce the potential for culvert plugging. Another method is to apply secondary treatments such as flared inlets or trash barriers for suspected culverts that are likely to plug.

MITIGATION TECHNIQUES FOR CULVERTS AND ROADS

RETAINING WALLS

Description: Retaining walls stabilize slopes where erosion and safety is a concern. There are four basic retaining wall classifications: mechanically stabilized backfill, driven cantilever pile, tieback, and gravity.

Here in Mesa Verde National Park, a retaining wall ensures water will not erode the road. Photo: FHWA

Application: Retaining walls are primarily used to stabilize inherently weak sections of ground, to minimize damage from surrounding erosive forces, or at any location where a vertical slope is needed. Construction and function vary by ecoregion. Unstable slopes, or slopes eroding continuously into roads, ditches, and streams may benefit from retaining walls. Large fractures forming along a slope may indicate a potential future slump or slide that needs reinforcement. Retaining walls can be used on both cut and fill slopes and can physically separate roads from channels.

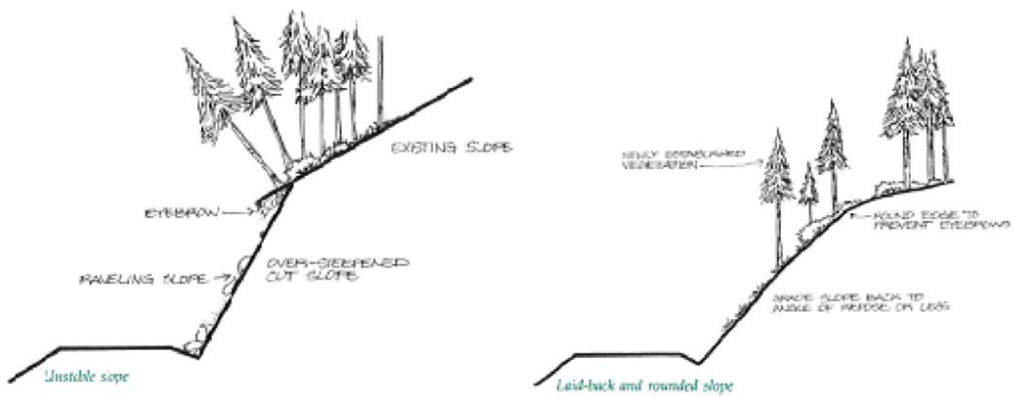
Considerations: Along streams, retaining walls may straighten the stream segment, increase water velocity, eliminate vegetation, and decrease shading. This may harm aquatic life, make access to the stream difficult for wildlife, and increase bank erosion, sedimentation and water temperature. Designers must weigh the benefits of controlling sediment production, preserving slopes, and stabilizing roads against other impacts retaining walls may have on a stream. Retaining walls require geotechnical investigations prior to design. Ground water infiltration behind a retaining wall can cause failure if wall drainage is not provided. Construction methods must be true to the design. Aesthetics play an important part in roadway design. Working with landscape architects assures a pleasing and appropriate design. Soil nail walls allow for vertical or near vertical slopes without footings. This minimizes exposure to erosion and reduces the area of environment impacted. The shot-crete facing provides a natural rock appearance and texture, and provides habitat for cliff dwelling wildlife. Construction costs and methods depend on the retaining wall.

Potential Outcome/Benefits: Retaining walls stabilize slopes, reduce erosion, and if faced with shot-crete, provide a natural rugged look. Eliminated output of soil and debris to ditch.

SLOPE ROUNDING AND REVEGETATION

Description: Slope rounding and revegetation lays back hillslopes to a natural angle of repose to reduce runoff and sediment transport, and to promote vegetation re-establishment. Seeding or planting often follows slope shaping.

Application: Use slope rounding and revegetation where there is potential for the site to erode, slump or fail, and cause damage and/ or create hazardous conditions to roadways, water bodies, structures, and property. This technique works on slopes disturbed by natural events such as fire and landslides, or human-disturbed slopes such as road cuts and fills, borrow areas, waste areas, or timber harvest areas. Size and severity of disturbance, and slope steepness, dictates the level of slope rounding and revegetation required. Project sequence usually requires reshaping hillsides with heavy equipment, spreading grass seed and protective mulch, then implementing soil bioengineering and biotechnical stabilization projects.



The change in slope can reduce the amount of erosion incurred. Photo: Washington State DOT

Considerations: Native plant species should be used when replanting to avoid introducing exotic invasive species that could adversely affect other ecosystem components. Using plant species attractive to wildlife may increase the risk of disturbance or mortality by attracting them to the road. Treatments implemented immediately after disturbances reduce negative effects from unstable slope conditions.

Monitor recently completed projects to check plant survival. In areas where excessive runoff and erosion could be a problem, visit sites during and immediately following runoff events. Annual checking and documentation of newly treated sites is recommended. Harsh growing sites may require multiple plantings or temporary irrigation.

Potential Outcome/Benefits: Stabilized slopes have minimal onsite and offsite sediment movement, are aesthetically pleasing, and provide better conditions for vegetation re-establishment.

REVEGETATION

Revegetation Description: Roads are often constructed adjacent to streams and floodplains, resulting in excessive degradation and removal of riparian vegetation. Riparian and wetland vegetation are critical to regulating stream microclimate, providing food and cover for wildlife, and controlling erosion and surface runoff. Removal of vegetation for road construction and associated land management activities creates a need for effective riparian-wetland vegetation restoration. Depending on the source of impacts, numerous techniques can be used to re-establish vegetation or allow stressed vegetation to recover.

Application: Replanting of riparian areas has been successful nationwide, especially along major stream and river corridors. If hydrology is to be restored, it may be delayed 2–3 years to allow seedlings to become well established.

Revegetation in the beginning stages for Chester Creek, MN. Photo: City of Duluth.

Indicators of appropriate use include: (1) lack of understory vegetation; (2) elevated browse height on trees and shrubs; (3) fragmented forest and riparian corridors; (4) sediment loading and turbidity in adjacent streams; (5) elevated stream temperatures; (6) erosion and soil compaction; (7) the need to enhance effectiveness of wildlife crossing structures.

Considerations: Techniques to reduce compaction and erosion may need to be applied to accelerate vegetation recovery. Replanting riparian forest considerations are: soil permeability, hydrologic alterations, wind-borne seed sources, adjacent forest blocks, current recreational use, and wildlife and fish species present. Restoration will be most effective if the replanted site is reconnected to the adjacent stream or river channel. If the replanted site is connected to other forest blocks, wildlife requiring large forest blocks will benefit. Additional considerations are the presence of sensitive species or current recreational use of the area.

Potential Outcome/Benefits: Improved riparian vegetation, increased wildlife and fisheries habitat, improved water quality, decreased erosion, decreased fragmentation, larger habitat blocks for area-sensitive wildlife species if the replanted site is connected to other forest blocks

SOIL BIOENGINEERING

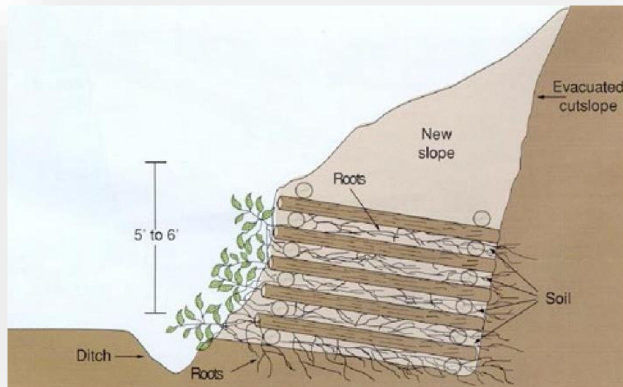
Soil Bioengineering Description: Biotechnical stabilization and soil bioengineering stabilization both use live vegetation as important structural as well as aesthetic components. Soil bioengineering is a specialized subset of biotechnical stabilization that uses live plant parts

(roots and stems) as the main structural and mechanical elements in a slope protection system to stabilize surface erosion features and shallow rapid landslides. Soil bioengineering treatments provide sufficient stability so that native vegetation and surrounding plants can gain a foothold to eventually take over this role. Successful implementation of soil bioengineering stabilization requires knowledge of the factors governing the mass and surficial reinforcements and drains, and the hydraulic and mechanical effects of slope vegetation.

Application:

Live staking is branch cuttings inserted into the ground to stabilize shallow earthen slips and slumps.

Live cribwalls are box-like structures constructed of timbers, backfilled with soil, then planted with branch cuttings extending outward. Cribwalls cannot resist large, lateral earth stresses.



Live cribwall construction. Source: U.S. Forest Service

Live fascines are long bundles of branch cuttings bound together into cigar-like structures to reduce surface erosion on steep rocky slopes where digging is difficult. On long or steep slopes, intense runoff can undermine fascines near drainage channels.

Brushlayering can stabilize hillslopes and channel banks with horizontal and vertical plantings of live plant cuttings. Buried cuttings provide immediate site reinforcement. Secondary soil stabilization occurs as buried stems take root, and leafed-out cuttings provide a natural look.

Branchpacking is used to repair small slumps or holes by alternating layers of live branch cuttings and compacted backfill. As plant cuttings grow, trapped sediment refills holes, and roots increase soil stability. This technique is not effective in slump areas greater than four feet deep or five feet wide.
Gully repair in small gullies can be accomplished by alternating layers of live branch cuttings and compacted soil. This technique immediately reinforces soil, reduces runoff velocities, and provides erosion barriers.

Log terracing uses earthen terraces reinforced with logs to reduce slope length and steepness. Terraces provide stable areas for plantings that further stabilize the sites.

Considerations: Soil bioengineering is an effective solution that may need to be used with a geotechnically engineered system. Plant species vary depending on ecoregion and soil conditions.

Potential Outcome/Benefits: Soil bioengineering techniques stabilize surface erosion and shallow rapid landslides, reduce excess surface/subsurface drainage, and strengthen soils.

INVASIVE SPECIES

Description: Exotic plants and animals can disrupt ecological processes with invasive behavior or growth patterns. Roaded riparian areas and wetlands are particularly vulnerable because roads facilitate infestation. Brown-headed cowbirds follow roads up riparian areas and lay their eggs in other birds' nests. Invasive mussels damage water systems and native species. Noxious weeds crowd out native species and cause erosion by reducing soil cover.

Application: The following control strategies apply primarily to noxious weeds, but some apply to all invasive species.

<u>Prevention</u>: Power wash equipment before entering worksites; inspect and pre-treat infested access roads, gravel and borrow sources for weeds prior to use; limit active road construction sites to necessary vehicles. Limit grain-feeding livestock near riparian areas to reduce spread of brown-headed cowbirds.

<u>Identification</u>: Consult with local extension office, county weed superintendent, or forest weed specialist on weeds currently at worksites; know potential invaders from adjacent areas; watch for all life stages.

<u>Prioritization</u>: Differentiate invasive weed species from more common non-invasives. Attack small or outlying populations or new invaders first.

<u>Develop threshold strategies</u>: competitive species (control), moderately competitive (suppress or contain), non-competitive (defer).

<u>Treatment</u>: Fill in bare ground with fast growing native cover species, weed-free mulch, geotextiles or crushed rock. Over-seed with certified weed-free compatible or native seed. Fertilize to encourage competitive growth of native species. Use biological controls to control seed production on existing widespread weed populations, and herbicides for a definitive response in smaller populations.

<u>Monitoring</u>: Evaluate effectiveness of integrated pest management programs. Map existing and expanding populations or new invasions. Modify treatment to increase control.

Considerations: Pre-treating access roads and borrow sources will not deplete existing noxious weed seed banks. Identification of noxious species can be a problem because early growth stages and some native non-invasive species look similar. During treatment program development, consider erosion potential, high water tables or surface water, sensitive plants, recreation areas, cost, equipment or skill needs, and application timing. Factor cost and timing into monitoring effectiveness.

Potential Outcome/Benefits: Protection or restoration of existing native biodiversity, erosion control and forage production for livestock and wildlife.

BIOTECHNICAL STABILIZATION

Description: Biotechnical stabilization and soil bioengineering both use live vegetation as important structural as well as aesthetic components. Biotechnical stabilization uses mechanical elements in combination with plants to arrest and prevent slope failures and erosion, and biological and mechanical elements are integrated and complementary. Biotechnical stabilization integrates living vegetation and inert structural or mechanical components such as concrete, wood, stone, and geofabrics to reinforce soil and stabilize slopes. Geofabrics are made from synthetic polymers or from natural materials such as jute and coir.

Application: Engineers usually use inert systems for slope stabilization and erosion control. Reasons for widespread use include availability, ease of installation, familiarity, existence of standards, and acceptance by specifiers. Inert materials are presumed to have predictable and invariant properties, but even inert materials slowly degrade, decompose, and decay with time. Vegetation can be incorporated into any of the following retaining structures, revetments, or inert ground covers that are porous or that have openings (interstices).

Retaining Structures:
• Rock breast walls
• Gravity walls (gabions, crib, and bin walls)
• Articulated block walls
• Reinforced earth structures (stacked and backfilled three dimensional webs)

Revetment Systems:
• Riprap (quarry stone, rubble, natural rock)
• Gabion mattresses
• Concrete facings (gunnite and concrete filled mattresses)
• Cellular confinement systems (three-dimensional webs that cover the surface and are backfilled with aggregate above)
• Articulated block systems (concrete blocks linked by cables or other methods)

Ground Covers:
• Artificial mulches (fiberglass roving and cellulose fibers)
• Blankets, mats, and nettings (slope coverings that protect the surface and promote/enhance the growth of vegetation)
• Cellular confinement systems (three-dimensional honeycomb webs that cover the surface and are backfilled with soil or aggregate)

Considerations: Many inert systems or products lend themselves to integrated or combined use with vegetation. For plant survival, moisture and sunlight must be available.

Potential Outcome/Benefits: Biotechnical methods can stabilize cut and fill slopes along highways or streambanks.

ROADWAY DIPS

Roadway Dips Description: Roadway dips modify roadway drainage by altering the road template and allowing surface flows to frequently disperse across the road.

Application: Roadway dips have applications nationwide, even on steep grades. They disperse surface water flows and reduce erosion in areas where sediment loading to a water body is a concern. Roadway dips may replace or supplement culverts for cross drainage, especially where existing culverts fail often or require high maintenance. Roadway dips may help solve erosion, ditch sloughing, culvert failures, cascading effects from overtopping culverts, high maintenance costs, and hydrologic disconnectivity.

Considerations: Roadway dip design and construction vary by road management objectives. Consider traffic limitations and install the proper length of dip to ensure that the design vehicle can be accommodated (logging truck, chip van, horse trailers, cattle trucks). See design manuals for dip spacing and depth. Depending on traffic volume and kind, warning signs may be needed to alert drivers to road changes. Dips may be used up to 10–15% road slope. Steeper slopes require longer dips. In some cases, riprap and/or asphalt can be used to harden the dip and disperse water for wet weather conditions or year-round roads. Roadway dip spacing is critical. Placement may be at ditch relief culverts or change in grade. This technique reduces maintenance, and it is important for grader operators to understand the need for the dip so they do not blade out the structure.

Potential Outcome/Benefits Roadway: dips reduce maintenance costs, sediment transport, the need for culverts, and the risk of catastrophic road or slope failure. They can lower traffic speeds to facilitate wildlife crossings.

LOW WATER CROSSINGS, OVERTOPPING, AND FORDS

Description: Low water crossings pass water and transport debris over a road continuously or intermittently. Types of low water crossings include vented fords, un-vented fords, and low water bridges. These structures can range from simple, stream-grade elevation, native-surfaced crossings to larger more massive structures. Allowing water to overtop roads is one of the most cost-effective options to mitigate flood damage. If successful, a flood can simply inundate a road and then recede with minimal damage to the integrity of the roadway.

Application: Low water crossings may be used on lower standard roads where continuous access is not required. They are ideal for channel systems that transport debris and bed load

The low-lying elevation of U.S. Highway 2 and intact floodplain allowed flood flows to spread out and overtop the road without causing major damage. Photo: WI Emergency Management

during high water events and for roads that will not receive periodic maintenance. Low water crossings require special designs to pass fish and aquatic organisms.

Considerations: Low water crossings construction materials include riprap, concrete, asphalt, Jersey barriers, and native materials. Geosynthetics may be used to provide separation of materials, subgrade support and restraint.

Potential Outcome/Benefits: Benefits include lower construction costs, reduced maintenance and potential for catastrophic road failure. Ponding water increases infiltration. Decreased fill heights result in fewer cleared acres and maintained riparian vegetation diversity. A low water crossing over a culvert disperses flow, reduces water velocity, and channel bank erosion. The potential consequences of catastrophic road failure are less due to reduced fill amounts, lower water velocity, and more erosion-resistant construction materials

PERMEABLE FILL WITH CULVERT ARRAY

Permeable Fill with Culvert Array Description: Permeable fills are generally used to cross meadows and promote the passage of sheet and subsurface flows with minimum flow concentration and maximum spreading. The road base and/or subbase is constructed of relatively large, preferably angular, uniformly graded rock to allow uninterrupted ground and surface water flow. Culverts within the permeable fill and above the drainage grade allow ponding of the water and percolation through the fill.

Photo: U.S. Forest Service

The installing of culvert with the invert elevation at a higher elevation than the meadow elevation can promote seepage and infiltration.

Application: Roads crossing wet meadows act as barriers to subsurface and sheet flow, resulting in altered hydrology and a loss of meadow functions. This technique may be used on ephemeral channels or meadow systems to promote water passage and maintain and restore wet meadow systems, or in high meadow areas that do not experience significant flooding. This technique is not recommended

in flash flood prone areas, or for fish bearing perennial streams unless passage is provided in the main channel. Permeable fill can be used in areas where the road restricts ground water flow, causing drier conditions in downslope areas.

Considerations: When a multiple culvert array is used, the culvert spacing should imitate the natural flood plain so flows are not restricted to a narrow section of the meadow. Design culverts to carry 100-year storm events. Install all culverts at the same elevation to avoid headcutting at the lower ones. Culverts may require outlet energy dissipaters. Fill heights should be kept to a minimum to reduce consolidation pressures on underlying soils. To reduce costs, keep culverts short and minimize fill volume. In areas with large woody debris or significant bedload, adding an overtopping structure or ford, will provide passage of water and debris. Design culverts to allow unrestricted passage for all life stages of amphibians, fish or small wildlife.

Potential Outcome/Benefits: Permeable fills can maintain and/or restore natural wet meadow hydrology and result in maintained or restored wildlife habitat, vegetation diversity, and water storage.

RAISED CULVERT INLETS

Description: Culvert inlet elevations are raised by constructing a dike around the culvert or by installing a culvert elbow.

Application: Raised culvert inlets installed on ephemeral channels keep water on the land longer and promote infiltration. These techniques are applicable in all ecoregions. Inlets can be installed onto new or existing installations. Locate these on low gradient stream systems, in large or small floodplains. They can create and enhance wetlands in a watershed.
Indicators include vertical instability such as head cutting and eroding banks in straight stretches, loss of meander patterns, lowered groundwater tables, and a change or loss of upstream riparian and wet meadow vegetation.
Prefabricated elbows and bands are inexpensive and easy to install. A variety of materials, including rock, timbers, concrete drop inlets, or multiplate culverts, succeed as dikes.

Considerations: Some results of raised culvert inlets may be:
- Creation of a wetland environment
- Reduced passage of fish, aquatic organisms and small animals
- Restricted transport of debris and bedload
- A fixed water level

Potential Outcome/Benefits: Increased riparian vegetation vigor and diversity, reduced flood flashiness, sediment basin creation above the culvert, raised water table and increased infiltration and reduced headcutting.

ENERGY DISSIPATERS AND DEBRIS RACKS

Description: Energy dissipaters and aprons, used at culvert inlets and outlets, reduce water velocities, and prevent erosion. Dissipaters include riprap, vegetated ditches, concrete or steel baffles, and tiger teeth. Riprap is an apron of coarse rock installed on a cut or fill slope can prevent erosion and undercutting at culvert outlets and at other drainage outlets. Covering the exposed soil with rocks helps protect it from being wash away. Debris racks at culvert inlets can prevent clogging. Another alternative other than rocks is to apply a flexible concrete geogrid mat over the ground that can provide protection to the soil.


The area directly surrounding the culvert is covered in geotextile fabric, followed by a layer of clean, sediment free riprap. Photo: WI DNR

Application: Energy dissipaters and aprons can protect steep slopes and erosive soils by reducing water velocity, dispersing flows, and preventing channeling or undercutting at the culvert outlet. Dissipaters and aprons function on single or multiple culverts (arrays) during storm and normal flow events.

Culverts experiencing frequent debris clogging or plugging may benefit from debris (trash) racks. Debris racks at culvert inlets deflect large woody debris and bedload from the channel before it enters and clogs the culvert.

Considerations: If racks become clogged, flows will overtop the road and may cause catastrophic failure. Install debris racks only when regular maintenance is possible. When passage of debris and bedload is necessary, debris racks are a common culvert treatment, but may not be the best long-term solution.

Potential Outcome/Benefits: Energy dissipaters and aprons can reduce water velocity and potential erosion. Debris racks deflect debris and bedload preventing culvert clogging or plugging.

STREAM CHANNEL MODIFICATION STRUCTURES

Description: These techniques protect road embankments from channel scour and erosion. They can mitigate for loss or alteration of riparian vegetation, and restore riparian terrestrial and aquatic habitats.

Application: Roads are often constructed adjacent to river or stream channels and may serve as a source of sediment (surface erosion and road fill failure). Roads constructed adjacent to channels can influence channel meander pattern and geometry. This can straighten the channel, reduce channel complexity, cause loss or alteration of native riparian vegetation, and degrade terrestrial and/or aquatic habitats. In-channel structures can be installed to alter or modify channel flows either above or below channel crossing structures to improve fish passage. This technique has application within each ecoregion in the country.

A constructed meander stream modification that slows water. Photo: WA Department of Fish and Wildlife

Indicators include the presence of road prism or embankment failures, undermined channel banks below the road, need for frequent high maintenance or reconstruction, change in channel classification type, change in native vegetation, change in terrestrial and/ or aquatic habitat quantity and quality, and change in fish or wildlife habitat access.

Considerations: Install these structures at the lowest flow period of the year to reduce the amount of heavy equipment disturbance causing sedimentation and turbidity. These techniques are designed for small stream channels (2–3 order channels) and are not appropriate in large stream or river channels. Usually this technique is most effective in a series of in-channel and/or channel bank structures.

Potential Outcome/Benefits: In-channel and channel bank structures can reduce the higher maintenance or reconstruction costs resulting from road prism failures due to channel scour and erosion.

RECONNECTING CUTOFF WATER BODIES

Description: Culverts and bridges can reconnect side channels, ponds, wetlands and cut-off channel meanders within floodplains that have become isolated or cut off from the main channel due to the construction of a road prism**.**

Application: Roads constructed within the floodplain and adjacent to rivers or streams may isolate or cut off portions of the natural channel or wetland network. This can straighten the channel; increase water velocities, and cause loss or degradation of valuable aquatic and terrestrial riparian habitats. Structures can be installed within the road prism to create as many reconnections as needed to meet one or more of the following resource objectives: (1) restore access and use of historic fish and wildlife habitats; (2) restore hydrology and significant aquatic habitat (an increase in channel meander and channel length or the amount of wetland surface area); (3) increase the channel or wetland diversity.

Indicators for use include (1) seasonal or year-round movement or migration of wildlife or fish species is impeded by the road; (2) a noticeable loss of fish and/or wildlife habitat (change in food, cover, and shelter); (3) the presence of non-native vegetation and /or animals.

Considerations: Reconnecting water bodies to active river and stream channels within floodplains could increase the risk for damage from high flow events, such as flood flows to road and channel crossing structures. These structures require medium to high annual maintenance, especially in systems that move significant amounts of bedload and coarse woody debris. Restoring historic habitats and access to those habitats could increase the incidents of human interactions with fish and/or wildlife species (disturbance, poaching, etc.).

Potential Outcome/Benefits: Reconnecting floodplain water bodies can result in significant restoration of aquatic habitat quality and quantity, such as fish access to spawning or rearing habitat. Other benefits could be the long-term recovery of floodplain structure and function such as moderating effects of flood flows, increased channel or wetland diversity, and restored native riparian wetland vegetation.

ENGINEERED LOG JAM COMPLEXES

Description: Log jam complexes are multiple log structures placed in rivers and streams to protect channel banks, roadways, and other adjacent features. This is a similar technique to the stream channel modification technique.

Application: Log jam complexes protect roadways adjacent to river channels by emulating natural river processes. Log jam complexes are usually placed in series or in combinations. These structures are suitable for larger channels, 3rd order or higher. Engineered log jams are one type of log jam complex and can have up to 500 wood pieces. Log jam structures can: 1) stabilize channel banks and protect roads using native materials; 2) deflect and catch large woody debris in transport; 3) promote establishment of vegetated riparian areas such as channel banks and in-channel riparian islands; 4) improve and create new fish habitats; 5) restore and maintain natural river system characteristics.

Considerations: Install log jam complexes at the lowest flow period of the year to reduce disturbance to the riparian area by heavy equipment. Use sediment reduction treatments as necessary. Use techniques to keep fish away from the construction area. Consider the proximity of these structures and the potential risk to other public and private property located downstream before and during project implementation.

Potential Outcome/Benefits: Benefits provided by engineered log jams include: 1) initiation of channel scour and deposition around the structures; 2) retention of woody debris in transport within the river system; 3) increase in channel complexity such as meander pattern and geometry; 4) restoration and improvement of aquatic and terrestrial habitats.

BEAVER POND STRUCTURES

Description: Roads passing through riparian and wetland areas may act as dikes or dams impeding water flow. Beavers are attracted to this ponded water because they can impound water with little additional work by simply blocking or plugging culverts. Several water control structures, such as beaver pond levelers, have been developed to facilitate water movement through beaver dams and roads subject to beaver activity. These devices can maintain the valuable fish and wildlife habitat created by beavers while reducing damage to roads and other structures because they allow water movement but prevent complete removal of water from the ponded area.

Application: These structures maintain wetland habitat created by beavers and lower the water level of these ponds, reducing the risk of road erosion. Beavers search for leaks along the road berm or embankment and detect leaks by the sound and velocity of moving water. Beaver pond levelers lower pond water levels by extending the water intake well beyond the road berm or embankment and dispersing the water through a perforated pipe instead of one large culvert opening. This technique is appropriate when (1) beavers dam culverts and other road outlet structures; (2) the road prism is saturated; (3) beavers cause road erosion caused by beaver ponds built above the culvert inlet.

Considerations: Beaver pond leveler structures maintain ponded water levels above road/channel crossings during normal flow conditions. They are typically not designed to transport runoff from large storm events. Major roads should also contain nearby spillway areas to transport high flows (floods) across roads.

Potential Outcome/Benefits: Expected benefits include (1) maintaining fish and wildlife habitat created by beaver ponds; (2) reducing damage to adjacent roads, (3) maintaining floodwater storage; (4) maintaining the water purification functions of beaver ponds.

WETLAND MAINTENANCE

Description: Roads located near riparian areas and wetlands may contain culverts that alter the natural hydrography of these water bodies. These culvert placements often set the water level either above or below natural levels. Most wetlands have seasonally fluctuating water tables allowing plants and animals to fulfill their annual life cycle requirements. Certain wetland maintenance techniques, such as stop-log structures, maintain water levels of wetlands located upstream from roads, simulating the natural hydrology throughout the year. Habitat for native fish, wildlife, and plant species can be maintained and restored by this technique.

Application: These structures are commonly used along most of the diked, dammed and drained river floodplains across the U.S. to restore and maintain wetland functions where hydrology has been altered and is no longer capable of functioning naturally. Structures such as stop-log structures have application on most forest and rangeland ecosystems, especially where roads traverse wetlands and marshes that naturally have seasonal variations in water levels. Depending upon the debris-loading situation at each site, different types of stop-log structures (as shown in these photos) can be used to reduce or prevent the plugging of culvert inlets. Indicators for use include: (1) existing wetland crossings; (2) the presence of tree mortality; (3) change in vegetative species composition

Considerations: Traditional stop-log structures should not be used alone, or where fish or aquatic invertebrate passage is a management objective. Stop-log structures can be modified to allow increased fish passage, but complementary fish passage structures are preferred. Consider traffic and roadbed loads when choosing among available corrugated metal pipe and reinforced concrete pipe structures. Maintaining the seasonal and annual desired water levels for forested wetlands and freshwater marshes will vary according to resource and road management objectives in each ecoregion.

Potential Outcome/Benefits: More diverse and natural plant community, and maintained or restored habitat for fish and wildlife species

Example: https://www.fs.fed.us/rm/pubs/rmrs_gtr102_2.pdf

FLOOD PREVENTION TECHNIQUES FOR WATER AND WASTEWATER UTILITIES

Flooding is one of the most common hazards in the United States, causing more damage than any other severe weather-related event. It can occur from swollen rivers, heavy rains, spring snowmelt, levee or dam failure, local drainage issues, and water distribution main breaks. Impacts to drinking water and wastewater utilities can include loss of power, damage to assets and dangerous conditions for personnel. As storms become more frequent and intense, flooding will be an ongoing challenge for drinking water and wastewater utilities.

Drinking water and wastewater utilities are particularly vulnerable to flooding. A wastewater treatment plant is at greatest risk for flooding when it's sited in a low-lying area near the body of water where it discharges its final effluent. Heavy inflows from storm events can also overwhelm a treatment plant, resulting in discharges of diluted effluent into nearby lakes or rivers. Instances of flood-induced overflow (bypass wastewater) occurring at wastewater facilities in northwest Wisconsin are well documented. The City of Ashland wastewater utility experienced 20 overflow events in a 5-year period. Much of the region, including the City of Ashland experienced 500-year flood events in 2012, 2016, and 2018. The increased magnitude and frequency of these events is cause for great concern with regard to wastewater utility flood resiliency.

There are four basic steps involved in increasing your utility's resilience to flooding.

- Step 1 – Understand the Threat of Flooding
- Step 2 – Identify Vulnerable Assets & Determine Consequences
- Step 3 – Identify & Evaluate Mitigation Measures
- Step 4 – Develop Plan to Implement Mitigation Measures

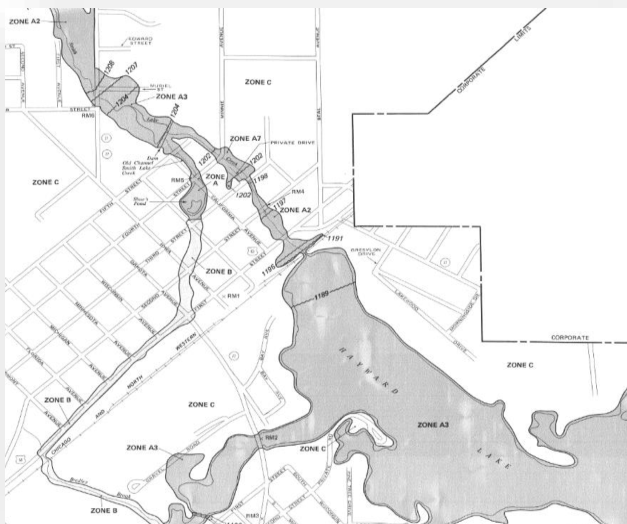
To help you through this process, work with a team of your partners and stakeholders. This team could include your utility staff (e.g., operators, supervisors, and field staff), other partners from local government (e.g., town engineer, public works staff, floodplain managers, emergency response personnel) and state government (e.g., primacy agency staff, hazard mitigation officers). It will be helpful to hold a kick-off meeting with this team to discuss goals and responsibilities to complete the assessment and implement mitigation measures. The four steps should be completed sequentially; however, they do not have to be completed all at once. Complete the steps as time and resources permit.
Flooding depends on various factors including rainfall, topography, river-flow, and drainage. The threat of flooding is based on the likelihood that such a flooding event will occur. The Federal Emergency Management Agency (FEMA) is a resource to help you. FEMA produces maps of a "100-year flood" (a flood event that has a one percent chance of occurring in a given year) and a more catastrophic "500-year flood" (a flood event that has a two tenths of a percent chance of occurring in a given year). NWRPC has also developed maps that highlight areas of concern. Maps produced by NWRPC are not to replace those created by FEMA.

Step 1 – Understand the Threat of Flooding
To better understand the threat of flooding, your utility should first examine historical flooding data and review Federal Emergency Management Agency (FEMA) *Flood Maps*.

- Review utility records of past flooding events to come up with a description of damage to the utility. Also look at newspapers, historical data, local flood plain

information, and talk to hazard mitigation experts to create a picture of previous floods.

- Identify which potential sources of flooding could impact your utility like flash floods, swollen rivers, spring thaw, levee/dam failure, non-natural causes (e.g., main breaks) or coastal flooding.
- Identify which floodplains your utility system is located within and create a chart of critical equipment and where that compares to the flood plain. Floodplain maps can be viewed online at https://msc.fema.gov/portal/home.
- Decide on what flooding threat your utility wants to prepare for (e.g., 100-year flood, 500-year flood)



Flood Insurance Rate Map, City of Hayward

Utility System	100-Year Floodplain (Flood Reaches Elevation (1110 ft.)	500-Year Floodplain (Flood Reaches Elevation (1113 ft.)
Intake (1108 ft.)	✓	✓
Treatment (1112 ft.)		✓
Distribution/Collection (1110 ft.)	✓	✓
Storage Tank (1120 ft.)		
Pump Stations (1112 ft.)		✓

Step 2 – Identify Vulnerable Assets & Determine Consequences

Often located in low lying areas, water and wastewater utilities are particularly vulnerable to flooding. Water and debris can inundate the facility, thereby damaging equipment and structures and causing power outages. Such impacts can lead to various consequences including costly repairs, disruptions of services, hazardous situations for personnel, and public health advisories. In this step, identify the assets that are vulnerable to flooding and determine

the resulting consequences to those assets and to overall utility operations. Using this information and your judgment, determine the assets/operations that you will need to protect from flooding.

It is important to understand how your drinking water or wastewater utility may be impacted by flooding events so that you can identify appropriate mitigation actions to eliminate or reduce asset damage and prevent service disruptions.
To identify which key utility assets/operations are vulnerable to flooding, you should conduct an onsite inspection to locate assets and document elevations. Compare these elevations with the threat elevations in the FEMA Flood Map. The assets/operations that are vulnerable to flooding and that result in significant consequences for the utility are candidates for mitigation and protection. Below are instructions for evaluating vulnerabilities of assets and the resulting consequences at your utility.

- Measure elevations of critical utility assets to determine key operation that could be damaged from flooding.
- Evaluate the consequences based on replacement costs and the impacts to facility operations.
- Based on those the prior assessments, determine priority need for mitigation to improve flood resilience.
- Evaluated routes to and from the utility. Are they out of the danger zone and can the utility be accessed in a case of a flood?
- Conduct a wastewater utility risk assessment. Utilize the Vulnerability Self-Assessment Tool (VSAT) tool developed by USEPA. VSAT is a risk assessment application for water, wastewater, and combined utilities of all sizes. It allows utilities to assess their vulnerabilities to both man-made and natural hazards and evaluate potential improvements to enhance their security and resilience. https://vsat.epa.gov/vsat/

Step 3 – Identify & Evaluate Mitigation Measures
First, identify possible mitigation measures that can protect the key vulnerable assets and operations prioritized in Step 2. Then, evaluate which mitigation measures make sense to pursue and implement.
To improve your utility's flood resilience, you should identify and evaluate which mitigation measures to pursue based on cost, effectiveness, and practicality. It is possible that some mitigation measures could be implemented at little to no cost to your utility. Below are instructions for evaluating mitigation measures at your utility.

- Determine your utilities minimum requirements to maintain critical services during a flood.
- Identify and evaluate what mitigation measures the utility can put in place to protect against damage.
- What is it vulnerable to? Access? Flooding to the facility and where is the water entering in? Sump pump to take water out, if it can take it out faster than it comes in.
- Short term- sand bagging. Plan how to get to and from the facility.
- Test generators weekly.
- Records retention back up at city hall or other building outside of floodplain

- Make a short-term plan and long term. Assign levels of risk and make list of minimum things that have to be done prior to a flood.

Step 4 – Develop Plan to Implement Mitigation Measures
Your utility will need to develop a plan to implement mitigation measures to reduce or eliminate asset damage and service disruptions during flooding. The plan should be revisited periodically and address actions, schedule, funding, responsibilities, etc. For example, flood mitigation measures that involve major capital and infrastructure investments should be integrated into the utility's overall scheduling in the asset management planning process (e.g., phasing in flood-resistant pumps). Now that you have selected mitigation measures, develop a plan to implement them.

- Conduct a cost benefit analysis to find identify which mitigation measures are most cost effective and critical to increasing resiliency to flooding. Build these mitigation plans into your budget. Apply to local/state/federal funding/bonds to help implement these measures.
- Create an implementation plan for the appropriate mitigation measures with specific timeframes.
- Look at age of infrastructure and figure out when things have to be replaced and implement gradual replacement program so it's not a onetime financial hit.

Mitigation Measures for Drinking Water and Waste Water Assets
It is important for drinking water and wastewater utilities to protect their buildings and other structures from floods. This includes any entryways, both obvious (e.g., doors, windows, floor drains) and not so obvious (e.g., wiring conduits, overflow drains, cracks) where water can enter structures. Significant damage can result from flood waters entering a building; water can damage or destroy the structure, process equipment, communications and controls, records and field and administrative equipment. Flood waters can also restrict access to the facility. These impacts could result in loss of service for your customers and significant repair costs for the utility. Utilities should establish emergency monitoring and warning systems (alarm systems where possible), emergency preparedness protocols and evacuation procedures for all buildings and facilities.

<u>Prevent buildings from flooding.</u>

- Caulk and/or seal wall and floor openings (e.g., windows, doors, garages)
- Install backflow prevention devices on sewers and drains.
- Install waterproof protection (e.g., removable/semi-permanent structures, sealed doors, shields) for building entry points (e.g., windows, doors, garages).
- Build floodwalls, levees or berms around the treatment plants.

<u>Protect critical components if buildings do flood.</u>

- Ensure that staff know the protocol on how and when to shut down and start up power and gas supplies, electrical controls, operating systems, and other equipment in system facilities.
- Create locations outside the flood zone where utility equipment (e.g., heavy equipment, vehicles, replacement parts, backup generators, pumps) can be stored permanently or temporarily, to prevent damage from flood waters.
- Prepare alternative routes to the treatment plant if it is blocked by floodwater or debris. Consult with other entities (e.g., Department of Transportation) to consider alternate road/transportation options (e.g., watercraft).

- Elevate or move equipment (e.g., computers, control centers, laboratories) to higher and safer ground to prevent them from being damaged.
- Always have a stock of spare parts.

Maintain operations when the electrical grid is down.

- Have a backup generator stored above the base flood elevation incase the electricity goes out.

Maintain continuity of operations during flooding.

- Regularly backup electronic and paper files that are either on-site or off-site. This should include all permits, compliance documentation, designs and as-built drawings, process diagrams, operations and maintenance records, standard operating procedures, operations data, and other vital information.
- Create a plan to operate the facility remotely if the buildings become inaccessible.
- Create interconnections or other partnership opportunities to share resources services with neighboring water utilities.

MITIGATION OPTIONS FOR WASTEWATER TREATMENT PLANTS

Wastewater treatment plants are typically located at low elevations and near a receiving water body, which may pose a significant flood risk to a facility. Flood waters can wash out primary and secondary clarifiers, aeration tanks and chlorine contact chambers, as well as upset bioreactors. Other impacts from flood waters include damage to mechanical and electrical equipment/controls, interference with biosolids handling and disposal systems as well as washing of contaminants into the treatment train. Treatment plants that are still operational during a flood need to be prepared to accommodate higher flow rates and increased pollutant loads.

Prevent treatment plant from flooding.

- Install permanent physical barriers like levees or floodwalls to protect the entire facility from flooding.
- Integrate green infrastructure in the areas surrounding the plant to divert flood waters away.
- Install a flood water pumping system and/or channel system to divert flood waters.
- Separate combined sewers to reduce the amount of flow to the treatment plant in a flood.
- Increase the capacity of storage tanks to manage overflows for future treatment.

Protect critical components if treatment plant does flood.

- Bolt down air tanks to prevent them from floating away if flooded.
- Develop the capability to temporarily remove and safely store vulnerable components before a flood.
- Waterproof electrical components.
- Elevate or relocate individual assets, vertically extend the walls of a treatment structure (e.g., clarifier, basin, tank) above flood stage, and/or flood-proof structures to prevent the seepage of flood water.
- Buy submersible motorized and electrical equipment.
- Prepare alternative routes to the treatment plant if it is blocked by floodwater or debris.

Maintain treatment plant operations when the electrical grid is down and/or access routes are blocked.

- Increase capacity size of the chemical and fuel storage tanks.

- Install more energy efficient equipment to increase the longevity of the fuel supply for backup generators.
- Replace motorized equipment with a diesel driven or dual-option counterparts.
- Purchase backup generators or find an alternative energy supply.

Have a means of bypassing normal treatment plant operations when necessary.

- Install an external connection to the facility's compressed air system to allow a portable air compressor to be activated if the main air compressor becomes damaged.
- Establish a call list of multiple companies that can provide "pump around" services in an emergency.
- Consider starting a regionalization project to divert the flow of wastewater to an alternate system for emergency wastewater collection and conveyance.

MITIGATION MEASURES FOR DRINKING WATER ASSETS

Flooded rivers and lakes can pose threats to source water intake structures by clogging them with excess silt/debris or by physically damaging them with debris. Flood waters that do enter the intake may carry increased contaminant loads and/or turbidity levels that may impact water treatment plant processes. Distribution system piping and appurtenances that are underground, along culverts and under bridges can be washed out by fast and high flowing flood waters. Finished water storage tanks also can be damaged by the force of flood waters. Groundwater sources also may be prone to damage. Flood waters can overtop wellheads, causing damage to the casings as well as contaminating the well water. Shallow wells near a flood zone can be contaminated even if the wellhead itself has not been overtopped. Distribution lines for groundwater sources can be equally vulnerable to flooding.

Prevent structures from flooding.

- Relocate or elevate pump houses and distribution system apparatuses that are vulnerable to flooding.

Protect critical components if intake, distribution and storage of finished water do flood.

- Protect and reinforce surface water intake pipes from debris, erosion and excessive silt. The installation of a jetty or breakwater can also keep debris/silt away from the structures. Another option is to install/upgrade the screen at the intake to prevent debris from building up.
- Waterproof, elevate or re-enforce distribution system appurtenances (i.e., fire hydrants, valve vaults) susceptible to flooding or damage from debris.
- Install submersible pumps or waterproof pump motors.
- Ensure that distribution lines across streams are sufficiently below the streambed.

Maintain delivery of safe drinking water during flooding.

- Sign up for U.S. Geological Survey (USGS) alerts for stream and river gauges: Water Alert
- Install monitoring equipment upstream of intake pipes to provide vital raw water conditions prior to a flooding event.
- Prepare alternative routes to intake structure and/or pump house if it is blocked by floodwater or debris.
- Create a plan to completely fill water storage tanks prior to a flooding event.
- Ensure that there are spare parts to repair critical equipment.
- Create interconnections or other partnership opportunities to share resources or to facilitate emergency public water supply services with neighboring water utilities.

MITIGATION OPTIONS FOR GROUNDWATER UTILITIES

Prevent well field/pump house from flooding.

- Procure temporary flood barriers (e.g., sandbags) for use in minor floods.
- Elevate the land directly surrounding the well field so water does not accumulate near the well. Ensure that the casing terminates at least 12 inches above ground level. Also, extend well casing above the flood zone.
- Relocate or elevate well field house pump houses to be above the flood zone.

Protect critical components if groundwater intake and supply do flood.

- Seal the top of well casings, waterproof well caps, and extend vents above the flood zone elevation.
- Maintain the integrity of surface seals outside casings and check that there has been no soil settling or that no cavity has developed around the outside of well casings where surface water would be able to flow down to the aquifer.
- Install submersible pump or waterproof pump motors and other critical equipment.

Maintain delivery of safe drinking water during flooding.

- Create a plan to completely fill water storage tanks prior to a flooding event.
- Prepare alternative routes to intake structure and/or pump house if it is blocked by floodwater or debris.

MITIGATION OPTIONS FOR BOOSTER STATIONS AND OTHER PUMPS

Flood waters can severely damage pumps, thereby impacting the entire drinking water system from intake through distribution. Similarly, loss of facility power could render pumps inoperable without adequate backup power. Vulnerable water facility control systems include pump controls, variable frequency drives, electrical panels, motor control centers, and Supervisory Control and Data Acquisition (SCADA) systems.

Prevent booster stations from flooding.

- Procure temporary flood barriers (e.g., sandbags) for use in minor floods.
- Install permanent barriers (e.g., flood walls, levees, sealed doors).

Protect critical components if booster stations do flood.

- Develop the capabilities to temporarily remove and safely store crucial components in advance of a flooding event.
- Waterproof, relocate or elevate motor controls, variable frequency drives, computer and electrical panels.
- Shut down power to systems prior to a flood to mitigate damage to electrical components.
- Replace non-submersible pumps with submersible pumps.
- Replace standard electrical conduits with sealed, waterproof conduits.
- Installing sump pumps for below-ground facilities to provide additional time to take other mitigations measure.
- Replace below-grade booster stations with an above-grade station that is above the flood stage.

Maintain pumping operations when the electrical grid is down.

- Store temporary or replacement pumps out of the flood zone.

- Install energy efficient utility systems to extend the fuel supply for backup generators in a flooding event.
- Replace pumps with diesel driven or dual-option counterparts.
- Weigh the option of having generators or an alternative energy supply.

Maintain pumping operations.

- Maintain a call list of multiple companies that can provide "pump around" services in an emergency.
- Stock extra portable pumps or specialized parts to repair damaged pumps. Consider having major components of specialized high capacity pumps on hand as well.

MITIGATION OPTIONS FOR DRINKING WATER TREATMENT PLANTS

Flood waters may inundate a treatment facility and wash out open tanks and filter beds, damage mechanical equipment, render electrical power and controls useless, spoil finished water storage, deposit debris on-site, or wash contaminants into the treatment process. Flood waters may also alter source water chemistry and turbidity, posing treatment challenges to utilities that continue to operate during a flood. For example, residence times may need to be significantly longer following a flood to attain safe drinking water standards due to high turbidity and the potential influence of contaminants in the flood waters.

Prevent structures from flooding.

- Erect physical barriers like flood walls, levees or have the ability to deploy temporary systems that can achieve the necessary protection.
- Install green infrastructure within and/or outside of the treatment plant to attenuate, divert, or retain flood water.
- Install flood water pumping systems and/or channel/culvert systems to collect and divert flood water way from the treatment plant.

Protect critical components if the treatment plant does flood.

- Develop the capabilities to temporarily remove and safely store crucial components in advance of a flooding event.
- Waterproof electrical component (e.g., pump motors, monitoring equipment) and circuitry.
- Elevate, relocate or cap individual assets to prevent damage from flood waters; vertically extend the walls of a treatment structure (e.g., basin, tank, filter) above flood stage; and/or flood-proof/seal structures to prevent seepage of flood water into the treatment train.
- Install submersible motorized and electrical equipment.

Maintain delivery of safe drinking water during flooding.

- Closely monitor the quality of water entering the treatment plant and be able to alter the treatment process for high levels of contaminants or increased turbidity. Further, develop guidelines now and prepare for what type of adjustments would have to be made to make changes in treatment during a flood.
- Have on hand portable, handheld testing equipment in case the permanent mounted testing equipment fails due to a flooding event.
- Connect with firms or enter partnerships to share resources or to facilitate emergency public water supply services with neighboring water utilities.

Maintain operation of treatment plant if electrical grid is down.
- Install energy efficient utility systems to extend the fuel supply for backup generators in a flooding event.
- Replace pumps with diesel driven or dual-option counterparts.

Increase storage capacity in preparation for floods.
- Create a plan to completely fill water storage tanks prior to a flooding event.
- Determine if increasing the plants emergency water storage would be beneficial (as opposed to water age/quality concern).

MITIGATION OPTIONS FOR CHEMICAL AND OTHER STORAGE

After a flooding event, adequate supplies of chemicals and fuel are vital to maintain utility operations during the days and weeks that follow. Chemicals are needed for continued treatment of water and wastewater and fuel is needed to run equipment including emergency generators. Flooding may impact these resources in several ways. Deliveries of chemicals and fuels can be disrupted if access to the facility is restricted due to high flood waters or debris. Without necessary chemicals or fuels, utility service could be disrupted for a prolonged period of time. Storage tanks are also at risk of being damaged from a flooding event. For example, chemical or fuel tanks that are not properly secured can be carried away, damaged, or ruptured, potentially resulting in leaks and spills that may contaminate utility assets and the environment.

- Elevate or relocate tanks above base flood elevation levels or erect physical barriers or secure the tanks to the ground.
- Ensure there are larger capacity chemical storage tanks to service the plant through an emergency until the supply chain can be restored.
- Create emergency contract provisions with multiple fuel and chemical suppliers and inform them of estimated fuel/chemical needs.
- Verify fuel and chemical tanks are topped off prior to a known flooding event.
- For groundwater drawn systems, obtain or get access to a portable chlorinator.

MITIGATION OPTIONS FOR INSTRUMENTATION AND ELECTRICAL CONTROLS

Instrumentation, electrical controls, and electrical wiring are critical components of drinking water and wastewater treatment processes and should be protected from flood damage to prevent a potential service interruption. Motor Control Units (MCUs) may be co-located with the equipment they monitor/control or they may be located in a central control room. Typically, MCU clusters are co-located with the pumps and other equipment that they control. With some modification they can be made more resilient to flooding. Supervisory Control and Data Acquisition (SCADA) systems also may be at risk of failure during a flood. Loss of SCADA systems can impact operations and data collection in operations centers, treatment facilities, processes and remote locations in distribution and collection systems such as valve chambers and pump stations. Utilities should be able to monitor and control operations manually if instrumentation and controls are off-line due to flooding impacts.

Protect instrumentation and electrical control from flood damage.
- Elevate or relocate instruments, control centers, and motor control units.
- Ensure a cache of spare parts to restart operations as soon as possible.

- Have portable equipment available if the permanent equipment stops functioning due to flooding events.
- Waterproof or buy waterproof models of instruments and controls.
- Inform staff to shut down non-essential electrical equipment and controls prior to a flood.

Maintain continuity of operations (e.g. redundant controls at another location) if instrumentation and controls are damaged by a flood.

- Install redundant controls at another location or create remote access capabilities.
- Train staff to be able to operate the water plant manually.

MITIGATION OPTIONS FOR POWER SUPPLY

Floods often result in power outages that have major implications for drinking water and wastewater utilities. Without a backup solution, outages can disrupt service leading to boil water advisories, sewer backups, or the discharge of raw sewage. To ensure continued service in the event of a power outage, a utility should consider a number of different strategies (e.g., backup generators, alternative/auxiliary source of power, energy efficient equipment) to run the critical components of its system keeping in mind that the minimum level of service required after a flood may differ from "normal" demands. Deciding on a strategy requires that you identify and evaluate your facility's sources, reliability, redundancies, and critical power needs.

Long before a flood, take measures to reduce the duration of power outages.

- Establish a list of key utility facilities (e.g., intake works, pump stations) that require critical power restoration and include the physical locations of the facilities and their corresponding power company account numbers. Be sure to communicate this information with the power company during an outage to expedite electricity restoration.
- Increase the priority of power restoration to your utility's facilities.
- Consider installing two independent power lines to your utility to avoid a complete shutdown if power is lost during a flood.
- Create a reliable connection to your power supply by installing a substation or through a dedicated feeder between the power station and the treatment plant.

Secure backup generators.

- Record the size and type of backup generator, along with the voltage, phase configuration, horsepower/amperage, fuel, etc.
- Connect pump stations to a portable generator. Ensure that the two systems can be connected quickly when the time is needed.
- Maintain a call list of various venders that rent portable generators and enter into an agreement to allow the sharing of backup generators during a flood event.
- Install your own portable or permanent generators that can be run on multiple fuels.

Secure a source of fuel for backup generators.

- Fill fuel storage tanks prior to a flood.
- Create an agreement with your fuel supplier and provide estimates of fuels needs in the case of a loss of power. Maintain communication with your local emergency management agencies for priority in receiving fuel supplies in an emergency.
- Have the capability for your utility's vehicles to carry fuel tanks.
- Perform an energy audit of your facility to identify areas that could be replaced with a more energy efficient appliance.

- Purchase additional/larger fuel storage tanks.

Install an alternative energy system.

- Consider installing solar panels or wind turbines to supplement your backup power supply.
- Install cogeneration units and/or a waste heat recovery system at wastewater treatment plants to reduce or eliminate dependence on the grid.

Prepare/protect electrical connections/equipment.

- Shut down electrical equipment prior to a flood event to minimize damage.
- Create "start and connect" checklists for all critical equipment in the facility.
- Equip generators and motors with disconnect fittings that can be taken off before a flood and then restored.
- Ensure existing electrical panels have an easy and effective way of connecting to external portable generators.
- Waterproof electrical connections/motor controls/junction boxes.
- Elevate or relocate electrical vaults and service panels.

MITIGATION OPTIONS FOR COLLECTION SYSTEM LIFT STATIONS

Lift stations are typically located at the lowest points in gravity-fed sewer systems and are therefore prone to flooding. Lift stations are also vulnerable to power outages. When lift stations lose power and do not have adequate emergency power, untreated sewage can back up into homes and businesses, flood streets, or run off into local waterways. This presents a serious threat to public health and the environment. Utilities should analyze various lift station failure scenarios (using flood stage in the flood zone for hydraulic calculations) and determine potential impacts to help inform mitigation decisions. Mitigation decisions will also depend on the type of lift station (e.g., wet or dry well), location (above or below grade), existing enclosure and ancillary equipment (e.g., minimal electrical/mechanical control equipment versus grit chambers, screens, electrical panels and other equipment).

Prevent lift stations from flooding.

- Procure temporary flood barriers (e.g., sandbags) for use in minor floods.
- Ensure that flood lines will remain over the anticipated flood stage to prevent floodwaters from entering the lift station.
- Install gates and backflow prevention devices on influent and emergency overflow lines to prevent flood waters from entering.
- Erect permanent physical barriers (e.g., flood walls or levees).
- Integrate green infrastructure in the areas surrounding the lift station to divert flood waters away.

Protect critical components if lift stations do flood.

- Install unions in the conduit system to reduce the time required to repair damaged sections.
- Install cogeneration unites and/or a waste heat recovery system to reduce or eliminate dependence on the grid.
- Develop the capability to temporarily remove and safely store vulnerable components before a flood.
- Waterproof electrical components, controls, and circuitry.
- Elevate or relocate electrical components above the anticipated flood stage.
- Install submersible pumps, flow meters, and gate/valve operators.

- Elevate a below-grade lift station above the flood stage.

Maintain lift station operations when the electrical grid is down.

- Update electrical equipment to be more energy efficient.
- Replace pumps with a diesel driven or dual-option counterparts.

Have a means of bypassing normal lift station operations when necessary.

- Have on hand a call list of multiple venders that can provide “pump around” services in a flood event.
- Ensure you have portable pumps to restore operation of the lift station if it loses power during an event.
- Consider starting a regionalization project to divert the flow of wastewater to an alternate system for emergency wastewater collection and conveyance.

MITIGATION OPTIONS FOR HEADWORKS

The headworks includes the structures and equipment at the beginning of the wastewater treatment plant, such as gates and flow controls, metering equipment, pumps, mechanical screens, and grit removal systems. This equipment is often at a lower elevation compared to the rest of the facility, increasing its vulnerability to flooding. If the headworks is off-line due to flooding, the rest of the plant would be inoperable. A failure of the headworks without a relief or bypass may also create backwater effects on the collection system that could flood streets and basements. Utility operators should identify how a headworks failure would affect the collection system and wastewater treatment plant performance using flood water elevations in the flood zone for hydraulic calculations and then implement the appropriate mitigation measures.

Protect critical headworks components from flooding.

- Install nonelectrical backup controls where possible.
- Develop the capability to temporarily remove and safely store vulnerable components before a flood.
- Install mechanical screens that can handle higher than normal sand, grit, trash and debris loading during and after a flood event.
- Waterproof or elevate critical components to the plant (e.g., motor control unites, instrumentation, electrical panels, etc.)
- Elevate, relocate or anchor pumps, screen motors, and other mechanical/electrical equipment.

Maintain headworks operation when the electrical grid is down.

- Consider installing a generator just for the headworks that is secure and has sufficient output.
- Replace pumps with a diesel driven or dual-option counterparts.